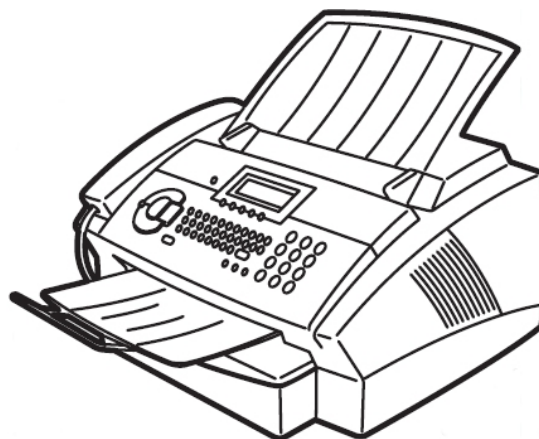


Service Service **Service**



Service Manual

Plain Paper Fax - Laser technology

A compact Copier, an integrated FAX machine combined with passive Fax Switch, document memory, automatic document and paper feeding, all in a Plain Paper Fax Machine, Caller ID and SMS (country and version depends)

Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified be used.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior permission of OKI.

Published by Service Department Facsimile Printed in Austria Subject to modification

(GB) 252163802.A



INDEX

1 SAFETY PRECAUTIONS.....	8
1.1 IMPORTANT	8
1.2 ESD	8
1.2.1 General.....	8
1.2.2 Precautions to Prevent ESD Damage.....	8
2 FEATURES	9
2.1 List of Features	9
2.2 Basic functions	10
2.2 Basic operations	13
2.2.1 Communication	13
3 OPERATION ELEMENTS	15
3.1 OKIFAX 4515.....	15
4 CONTROL PANEL AND LCD DISPLAY	16
5 TYPE OF LIST.....	18
5.1 Function list.....	18
5.2 Parameter list	19
5.3 List of Logs.....	20
5.4 Directory list	20
6 SERVICE FUNCTIONS	21
7 MAINTENANCE FUNCTIONS	25
7.1 Initialization Functions	25
7.2 Other Functions	25
8 TEST FUNCTION	26
8.1 Purpose.....	26
8.2 Enter Test Mode	26
8.3 Display	26
8.4 Keys used on Fax Keypad in Test Mode	26

8.5 Aboard Test	27
8.6 General Description of a Test-Step	27
8.7 Short Overview of Tests for Service	27
8.8 Description of Test for Service	28
8.8.1 INIT Testmode (Test-Code 100)	28
8.8.2 Speaker (Test-Code 108).....	28
8.8.3 Keys (Test-Code 109).....	29
8.8.4 LCD / Icons (Test-Code 110)	30
8.8.5 LED (Test-Code 111)	32
8.8.6 Sensors (Test-Code 112).....	32
8.8.7 Fan (Test-Code 120).....	33
8.8.8 EXIT Testmode (Test-Code 136).....	33
9 ERROR CODES	34
9.1 FAX ERROR Codes:.....	34
9.2 SMS ERROR Codes (Country dependent):	35
9.3 PRINTER Display Messages	35
10 FIRMWARE UPGRADING WITH PC KIT V1.1 (WINDOWS 2000 / XP)	36
10.1 To launch the utility:.....	36
10.1.1 States:	36
10.2 To select a binary file to be uploaded:	36
10.3 To start upload:.....	37
11 CUSTOMISATION OF THE DEVICE	39
11.1 Introduction	39
11.2 Commflag	39
11.3 Communicating with the Device	39
11.4 Reading the customization of a Device	39
11.5 Uploading the customization to a Device	40
11.6 Leaving the test mode	41
11.7 <i>Commflag</i> Batch File	41
11.7.1 Checking the current customization	41
11.7.2 Activating a new customization	41
11.7.3 Leaving the test mode via the batch file.....	41
12 DISASSEMBLY	44
12.1 Remove Operation Panel	44
12.2 Remove Upper Guide Assy.....	45

12.3 Remove Scanner	45
12.4 Remove Main Cover	46
12.5 Remove Main Controller PCB	48
12.6 Remove Pick Up Module	49
12.7 Remove Fuser Unit	50
12.8 Remove Drive Module	51
13 HARDWARE ARCHITECTURE	52
13.1 OBJECT	52
13.2 FUNCTIONAL DESCRIPTION	52
13.3 Block diagram	52
13.4 Digicolor2.....	53
13.5 Power Supply	55
13.6 Reset	56
13.7 Clocks	57
13.8 Memories	58
13.9 Interrupt management	59
13.10 Printer interface.....	59
13.11 LSU	60
13.11.1 Connector to LSU(P351)	60
13.12 Motor control	62
13.13 Sensor / Actuator	63
13.14 Heat control	64
13.15 Power supply interface.....	65
13.15.1 Connector to PGU(P350)	65
13.16 ADC for temperature and high voltage control.....	66
13.17 EPLD.....	66
13.18 Smartcard and ADC mutiplexing.....	67
13.19 Fuser interface	67
13.20 Scanner interface	67
13.21 CIS control	68
13.21.1 Connector to CIS (P300)	68

13.22 LED management.....	68
13.23 AFE.....	68
13.24 Motor control.....	69
13.25 SENSOR.....	69
13.26 MODEM & line interface	69
13.26.1 Description	70
13.26.2 Protection	70
13.26.3 Clip impedance	70
13.26.4 Line sensing	71
13.26.5 Line control.....	72
13.26.6 Gyrator (DC characteristics)	74
13.26.7 High impedance path	74
13.26.8 Signal flow.....	74
13.26.9 INTLOOP signal	77
13.26.10 EXTLOOP signal.....	79
13.26.11 RING	82
13.26.12 LIU_HOOK	84
13.26.13 PD	85
13.26.14 CURMOD	87
13.26.15 CIDIMP.....	89
13.26.16 MUTE	89
13.26.17 OFF_HOOK	90
13.27 Connection of the Codec to DC2 (low end).....	90
13.28 Connection of the codec to modem and DC2 (high end)	91
13.29 Audio	91
13.30 Speaker	92
13.31 External connection	93
13.31.1 Line Connector P701	93
13.31.2 External Phone connector P700	93
13.31.3 Handset connector P901	93
13.31.4 DECT connector(P900).....	93
13.32 USB Device.....	94
13.33 Operation panel unit interface.....	94
13.33.1 Connector P402	94
13.34 Wiring Diagram	95
14 TECHNICAL DATA	96
14.1 General.....	96
14.2 Paper	96
14.3 Toner Cartridge	96
14.4 Printer	96
14.5 Telephone	96

14.6 Fax	97
14.7 Copier	97
14.8 PC Connection	97
14.9 Scanner	97
14.10 SMS (Short Message Service) *	97
15 SAFETY - TEST SPECIFICATION.....	98
15.1 Demand	98
15.2 Abbreviations	98
15.3 Technical data	98
15.4 Additional requirements:	98
15.5 Terminals / plugs.....	99
15.6 Description / Earth Continuity Test / Isolation Test / High Voltage Test.....	99
15.6.1 General.....	99
15.6.2 Test Procedure.....	99
16 TROUBLE SHOOTING	100
16.1 Overview	100
16.2 Examples	102
16.2.1 Check with other cartridge.....	102
16.2.2 Check contacts.....	102
16.2.3 Grease on transfer roller	103
16.2.4 Copy quality.....	104
16.2.5 No printout / problems with paper feed	105
16.2.6 "Check printer device 02"	106
16.2.7 "Check printer device 04"	107
16.2.8 Paper jam 2	108
16.2.9 Paper jam 3	108
16.2.10 Document feed problem	109
16.2.11 Document jam	109
16.2.12 Multifeed of document.....	109
16.2.13 ScanRef-Failures.....	110
16.2.14 Skew Printer	110
16.2.15 Skewed Scanner	110
16.2.16 Sensor-Test failed	111
16.2.17 No display.....	111
16.2.18 Smartcard-Reader	112
16.2.19 Wrinkles on printout.....	112
17 TEST PROCEDURE (MINIMAL REQUIREMENT AFTER REPAIR)	113

I Introduction

In this Chapter you can find

- Safety precaution
- List of features
- Feature description
- Operation elements

1 SAFETY PRECAUTIONS

1.1 IMPORTANT

1. This Fax Model has been specified as a Class I Unit (grounded). The Telecom Line potential is isolated from the digital circuitry. To measure on the digital side, the measurement equipment should be connected to the same earth. For measurement on the Telecom side, measurement equipment should be ungrounded.
2. Service technicians must be made AWARE OF ESD and be GROUNDED! To avoid ESD risk you can order some ESD equipment in the parts list.
3. After each disassembly of the apparatus the same safety tests as in the production line have to be performed (see chapter 15 "SAFETY-Test Specification"). This tests include four different steps to guarantee safety of the product according IEC / EN 60950-1:2001

Test procedure: a.) Earth-Continuity Test
 b) Isolation Test
 c) High Voltage Test: Primary/Mains – Secondary (USB)
 d) High Voltage Test: Primary/Mains – Telephone line

WARNING!

Before opening the machine disconnect the Power Cable.

Never remove the isolation plate from the PGU

- HIGH VOLTAGE! -

1.2 ESD

1.2.1 General

ESD is a spark jumping from one conductive surface, charged with static electricity to another conductive surface. This incredibly fast movement of static discharge (the charge can jump to that conductor in a nanosecond) can have disastrous consequences, especially for electronic circuitry. We only feel ESD at a discharge of about 3.000 Volts. However many semiconductors can be damaged by a discharge of just 60 Volts or less. On non-conducting materials, such as plastics and textiles, charges remain stationary and cannot discharge and are therefore called static charges. Static charges are brought in by people and are generated during their normal activities.

1.2.2 Precautions to Prevent ESD Damage

Static electricity cannot be eliminated but it can be kept under control. Charging can be prevented by an appropriate grounding system for people and objects that may come into contact with the components or product.

TO PREVENT ESD KEEP THE FOLLOWING RULES:

1. All products being brought in for repair must be:
 - Processed in an ESD protected working area with a Grounded dissipative mat.
 - Kept in ESD protective packing material when not used.
2. Technicians should wear a wrist strap ground connected.

2 FEATURES

2.1 List of Features

Fax

- Laser printer on ordinary paper
- Modem: Super G3 33k6 modem
- Fax memory: 120 pages
- Fax switch: Automatic · Manual · EXT/Answering machine · Fax
- Polling of fax transmissions
- Automatic document feeder for 20 documents
- Broadcast function
- Time stamp
- Private branch exchange (PABX) possible (Laser Fax 3240, 3260)
- Telephone book with up to 200 entries (Laser Fax 3240, 3260)
- Ten groups with up to 199 entries (Laser Fax 3240, 3260)

Telephone (Laser Fax 3245, 3265)

- Private branch exchange (PABX) possible
- Telephone book with up to 200 entries
- Ten groups with up to 199 entries
- Additional functions possible (toggling calls, call waiting, etc.)

Paper

- Paper tray for up to 250 sheets
- Paper formats: A4 · letter · legal
- Ordinary typewriter and photocopier paper (60 to 90 g/m²)

Copier

- 64 grey tones
- Speed: 10 pages per minute
- Automatic document feeder for 20 documents
- Resolution: Fast · Quality · Photo
- Zoom: 25 to 400 percent
- Up to 99 copies from one document

Printing

- Black and white laser printer
- Resolution 600 dpi
- 10 pages per minute

Lists and Reports

- Functions list
- Journal Laser Fax 3240, 3260: (30 SMS or fax transmissions) Laser Fax 3240, 3260
- Journal Laser Fax 3245, 3265: (30 SMS or fax transmissions and telephone calls)
- Entries and groups in the telephone book
- Overview of the machine settings
- List of the pending transmissions
- Transmission report

SMS

- 160/640 characters *
- Memory for 30 messages
- Automatic printing
- Notification *
- Sending and receiving with sub-address (Terminal ID) *
- SMS to e-mail or Fax *
- * (Depending on country and network)

Scanner

- Resolution: 256 grey tones
- Speed: Six seconds for one A4 page
- Automatic document feeder for 20 documents

Computer-Connection (Laser Fax 3260, 3265)

- For PC
- Microsoft Windows® 98 SE · 2000 · ME · XP
- USB connection (1.1 as well as 2.0 full speed)
- Installation CD with automatic installation
- Printer Driver
- Twain Scanner Driver
- Paper Port 8.0 SE including OCR
- Acrobat Reader 6.0
- Companion Suite V1.0
- Printing from the computer (ten pages per minute)
- Add and edit telephone book entries

2.2 Basic functions

HELP Function

When needed, your fax machine can print out lists containing the most important functions and settings of the machine. Press the key **i** on the fax machine. Select with the Arrows whether you would like to print out the help page 1: functions list or the help page 5: setup. Confirm with **OK**.

1 You can also print out the function list by pressing MENU/OK, choose function number 41 and press OK.

2 List of settings will be printed out by pressing MENU/OK, 44 and OK.

- * To return to the previous menu step, by pressing **C** key.
- * Move the cursor on the display with the Arrow keys
- * Delete single numbers and letters with **C** or **←**.
- * To interrupt an operation in progress and return to the root menu without saving, press **STOP**.

Setting the Country

Use function 11 to select the specific country in which you will be operating your fax machine. It is essential to select the country because otherwise your fax machine will not have the correct settings for the local telephone network.

- 1 Press **MENU/OK**, 11 and **OK**.
- 2 Select the country by pressing the arrow keys
- 3 Confirm with **OK**. Pressing **C** will return you to the previous menu step; pressing **STOP** will return you to the root menu.

Setting the Language

- 1 Press **MENU/OK**, 12 and **OK** to set the language on the display.
- 2 Select the desired language by pressing the arrows.
- 3 Confirm with **OK**. Pressing **C** will return you to the previous menu step; pressing **STOP** will return you to the root menu.

Setting the Date and Time

- 1 To set the date and time on the display, press **MENU/OK**, 13 and **OK**.
- 2 Enter the date and time in the following manner: 08 08 05 14 00 for August 8th, 2005, 2:00 pm.
- 3 Confirm with **OK**. Pressing **C** will return you to the previous menu step; pressing **STOP** will return you to the root menu.

Entering Your Telephone Number and Name

Your number and name, entered using function 14, will appear in the page header of every fax you send and as the sender identification of your SMS messages. In each case, up to 20 different characters are available to you.

- 1 Press **MENU/OK**, 14 and **OK**.
- 2 Enter your fax number with the number keys, for example, 00 44 123 45... To enter a plus sign, simultaneously press the blue key and **Q**. You may add a space by pressing the space key. Confirm your entry by pressing **OK**.
- 3 Enter your name using the letter keyboard. To enter capital letters, press Shift and the desired key simultaneously. The symbols are displayed directly above the letter keys. To enter symbols, press the blue key and the corresponding letter key simultaneously. It is not possible to insert a symbol as the first character of your name.
- 4 Confirm with **OK**. Pressing **C** will return you to the previous menu step; pressing **STOP** will return you to the root menu.

Page Header

Your name and number appear in the page header of each fax transmission. If you do not wish to send out your information, you can turn off this function.

- 1 Press **MENU/OK**, 16 and **OK**.
- 2 Select TX HEADER with **◀/▶** and confirm with **OK**.
- 3 With **◀/▶**, select whether or not the page header should appear on every fax transmission.
- 4 Confirm with **OK**. Pressing **C** will return you to the previous menu step; pressing **STOP** will return you to the root menu.

New Toner Cartridge

Before you can receive documents, make copies, or print, a toner cartridge must be inserted into the fax machine. For this reason, a starter cartridge is supplied with the machine (this cartridge has a capacity of approximately 1,000 pages). The toner level memory for this starter cartridge was set at the factory. The starter cartridge need not be updated with a Plug'n'Print card.

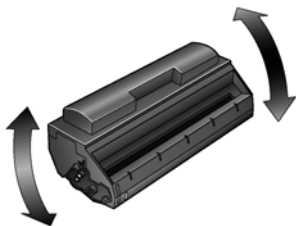
For each additional toner cartridge that you insert into your fax machine, you must update the toner level memory with the Plug'n'Print card provided.

In order to guarantee a good print quality, use only original toner cartridges. Other toner cartridges can cause damage to the fax machine. Use of other toner cartridges also voids the guarantee.

1 Open the cover by taking hold of **both** document guides and tipping the cover backward.

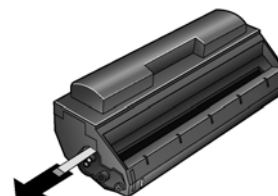
2 Remove the old toner cartridge, by gripping it at the recess in the middle and pulling it upward.

3 Take the new toner cartridge from the package.



4 Shake the new toner cartridge back and forth several times in order to distribute the toner evenly, thereby improving the print quality.

5 Completely pull off the protection strip located on the left side of the cartridge.



Once you have removed the protection strip, do not shake the toner cartridge any more. Otherwise, it is possible that toner dust will be released into the air.



6 Place the toner cartridge into your laser fax machine.
The cartridge should snap securely into position.

7 Close the cover. Make sure that the cover snaps securely into position on both sides.

8 NEW CARTRIDGE? appears on the display.
Confirm with **OK**.

9 Wait until INSERT CARD appears on the display. Push the Plug'n'Print card of the new toner cartridge into the opening on the left side next to the paper tray, with the contacts facing to the left. (Only the starter cartridge can be used without inserting a Plug'n'Print card.)



Should the error message Cannot read card appear on the display, you may have inserted the Plug'n'Print card incorrectly. The contacts must face to the left as you insert the card into the machine.

10 It may take a moment to update the cartridge. When the process is completed, the following appears on the display: ACTION COMPLETED / REMOVE CARD

11 Pull the Plug'n'Print card out of the fax machine. You can interrupt the recharging process at any time by simply pressing **STOP**. However, the toner level memory must be updated for each new toner cartridge. If you have pressed the **STOP** key by mistake, you can restart the recharging process as follows:

1 Press **MENU/OK**, 62 and **OK**

2 Select new black with the arrows, and confirm with **OK**. Select yes with arrows and confirm again. After a short time, the fax machine will ask you to insert the Plug'n'Print card.

If the toner level of your cartridge is low, then every time you open and close the cover, the following question will appear on the display: black=new? If you have not installed a new cartridge, press **STOP**. If you have installed a new cartridge, press **OK** and follow the description set forth above.

2.2 Basic operations

2.2.1 Communication

PAGE HEADER

TTI and page numbers are printed on each fax that is transmitted. It is possible to turn off the page header.

TRANSMIT TERMINAL IDENTIFICATION (TTI)

Identifies the user's fax unit by including the name and fax number that has been programmed into the fax unit on the top of every page. This allows the receiving parties to easily identify the source of all documents being sent to them. FCC regulations also require that transmitted documents identify the sender's name, phone number, transmission date and time.

TSI / CSI

TSI: Identification (Tel. Nr.) of the transmitting machine

CSI: Identification (Tel. Nr.) of the receiving machine

COMPRESSION METHODS

Modified Hoffman: method to reduce the data transferred via the telephone line. All G3 machines offer M.H. – coding.

Modified read: efficient coding system that increases speed by about 15%. M.R. is not available in some G3 machines.

AUTOMATIC BACKGROUND CONTROL

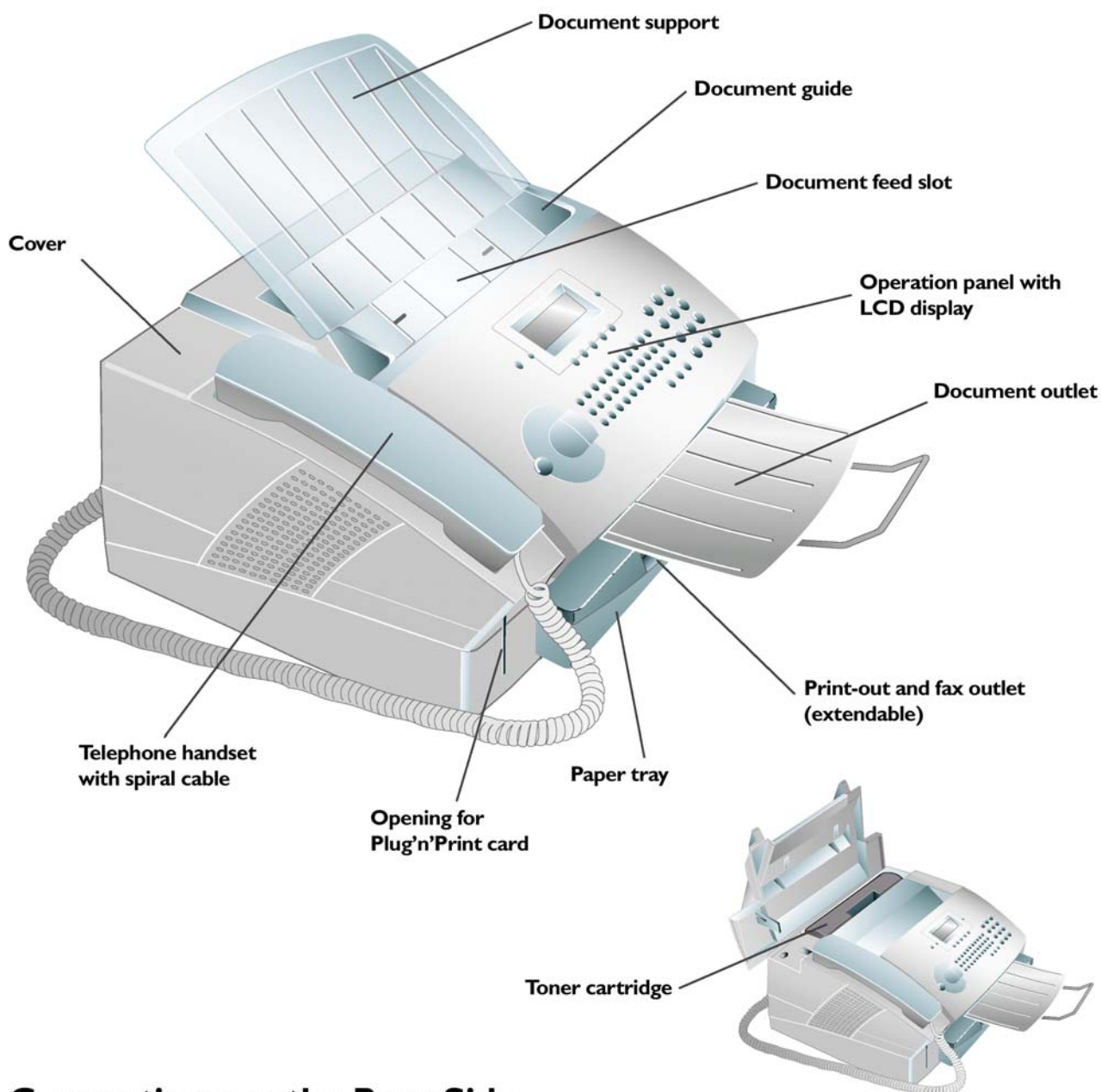
The background control (=intensity difference between the text and the background) is adjusted automatically.

TIME DATE STAMP

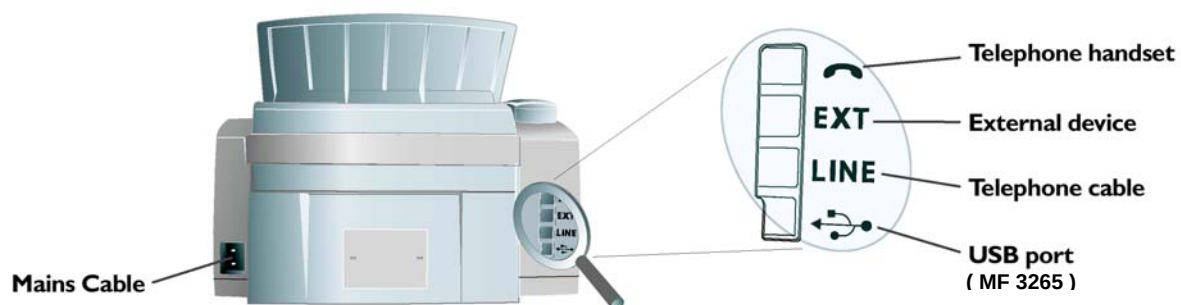
The fax machine will automatically record the date and time of every recorded message. If you play back a message, you will see data on display.

3 OPERATION ELEMENTS

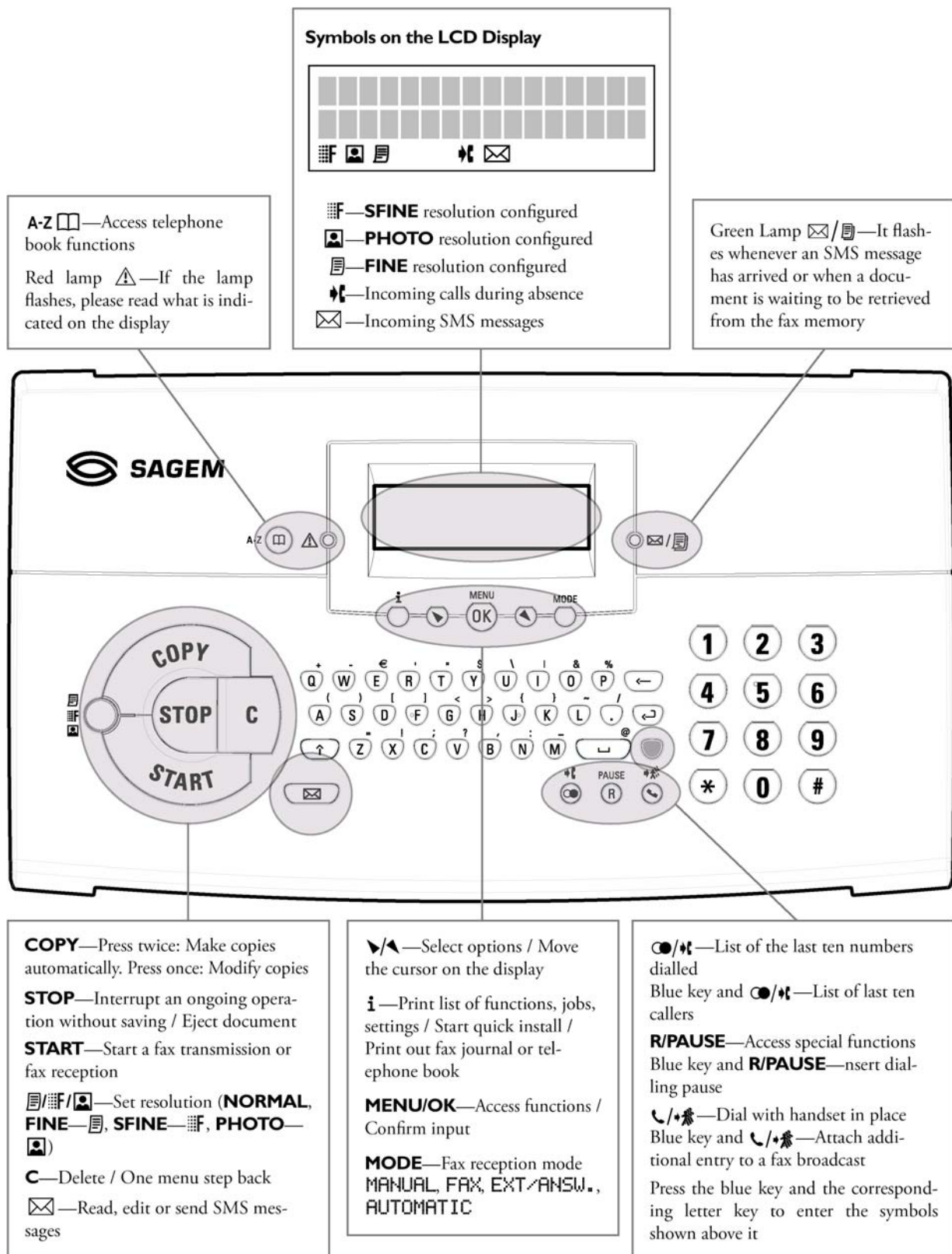
3.1 OKIFAX 4515



Connections on the Rear Side



4 CONTROL PANEL AND LCD DISPLAY



II Function

In this Chapter you can find

- Type of List
- Service mode
- Maintenance Function
- Description of service functions

5 TYPE OF LIST

5.1 Function list

To print the function list press M, 41 then OK, the function list is a summary of all user functions includes additional current settings.

Example of the list:

**** FUNCTION LIST ****

INSTALLATION

11	COUNTRY	Choice of Country
12	LANGUAGE	Choice of Language
13	DATE/TIME	Date / Time setting
14	NUMBER/NAME	Enter your name and your number
15	LINE TYPE	
16	TECHNICALS	Technical parameter
17	RING COUNT	
18	RINGER VOLUME	

FAX

21	TX SPEED	Reduce transmission speed
22	POLLING RX	Polling (receiving) a document
23	POLLING TX	Document to be polled (sending)
24	SEND LATER	Single or Broadcast in a certain time
25	SEND REPORT	Printing type of Send Report
26	TIME STAMP	
27	FAX ANSW.	Received fax printing Authorisation
28	RECEPTION	Setting Nr. of fax Copies and sorting

SMS SERVICE

31	SEND SMS	Send a SMS
32	READ SMS	Access received SMS messages
33	DELETE SMS	Erase SMS (selected, new, all)
34	PRINT SMS	Print SMS (selected, new, all)
35	PARAMETERS	SMS settings
36	SMS CENTERS	Server configuration

PRINT

41	FUNCTIONS LIST	Function list printing
42	LOGS	Print TX and RX logs
43	DIRECTORY	Print the directories
44	SETUP	User parameters printing
45	COMMANDS	Printing of commands list

COMMANDS

51	PERFORM	Perform a command
52	MODIFY	Update of commands
53	CANCEL	Delete a command
54	PRINT	Printing of a document in wait queue
55	PRINT LIST	Printing of the commands list

OTHERS

61	LOCK	Activate a lock code to limit access
62	PRINT. CARTR.	Set new cartridge and toner status
63	SAVE/LOAD	Save/load directory on microcard

Keys:

Redial : Redial the last 10 numbers dialled
Blue key + redial : Caller list
R/Pause : Special functions (Call waiting, toggling)
Blue key + R/Pause : Insert dialling pause
Handset key : On hook dialling
Blue key + handset key : Broadcast sending
I key : Print out function list, setting list

5.2 Parameter list

The current settings on your machine can be seen on your list of parameters.
Press M, 44 and then the OK button to obtain this list.

Example of the list:

** LIST OF PARAMETERS **

SID: Service

Number: 1234567

Date: 16-08-05 16:34

11	COUNTRY	Oesterreich
12	LANGUAGE	English
13	DATE / TIME	16-08-2005 16:34

TEL. NETWORK

151	NETWORK TYPE	PABX
-----	--------------	------

SEND REPORT

25	SEND REPORT	WITH
----	-------------	------

RECEPTION

25	NBR OF COPIES	1
28	SORTED PRINT	WITH

CART CAPACITY

	BLACK	53%
--	-------	-----

5.3 List of Logs

A list of all **TRANSMITTED** and **RECIEVED** faxes. If an error occurs during the transmission you will be informed by the error report which is printed out. This list is accessed by pressing M, 42 and then the OK button.

Example of the list:

**** LOGS ****

SID: Service

Number: 1234567

Date: 16-08-05 16:34

TRANSMISSION

Date/Time	Subscriber	Mode	Pages	Durat.	Status	Note
12-08 8:19	06763006777	NORMAL	1	0'27"	Correct	
12-08 14:35	06641648901	NORMAL	1	0'17"	Correct	
12-08 14:44	06763006777	NORMAL	1	0'26"	Correct	
12-08 14:49	06763006777	NORMAL	1	0'27"	Correct	

RECEPTION

Date/Time	Subscriber	Mode	Pages	Durat.	Status	Note
12-08 17:18			0	0'04"	Code 03	User break
12-08 17:20	+43 1 60101 4875	Normal	1	0'34"	Correct	
12-08 17:40			0	0'06"	Code 03	User break
19-08 13:54			0	0'06"	Code 03	User break

5.4 Directory list

This list provides a list of the numbers stored in your machine. This list is accessed by pressing M 43 and then the OK button.

Example of the list:

**** DIRECTORY ****

SID: Service

Number: 1234567

Date: 16-08-05 16:34

Name	Number	Directory
Mom	06641234567	0
Dad	06647654321	1
John Peterson	00431661554567	2
Sandra Douglas	06763006777	3

6 SERVICE FUNCTIONS

The fax is equipped with a set of logic blocks referred to as SOS (SOFT Switch) Nr.1 to 30. Each block consists of 8 bits called bit 1 to 8. Each bit can take a value of either 0 or 1. On the display, a block (from bit 1 to 8) is read from right to left. When a configuration is first selected, the blinking cursor is always placed on bit 8 (the bit at the left)

When the display shows the date and time, you can access the configuration bytes by means of the key sequence:

Menu * #

The description of these parameters can be found below. They are modified in the same manner as all others parameters.

SOFT-Switch 1: Ringing and Automatic Printing

Bit	8	7	6	5	4	3	2	1
Use	SOS-IMPTRA: Trace printing/ PC download enable	SOS-IMPTR30: Automatic Printing of T30 trace after comm. error	SOS-IMPTR30: Automatic log printing	Reserved	Reserved	Reserved	Reserved	Reserved
Values	0: no 1: yes	0: no 1: yes	0: no 1: yes					

SOFT-Switch 2: Scanner / Printer Configuration

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	Reserved	Reserved	SOS-BEEP: Keyboard beep on/off but not STOP key	Reserved	Reserved
Values						0: beep on 1: no beep		

SOFT-Switch 3: Line Configuration

Bit	8	7	6	5	4	3	2	1
Use	SOS-ECHO: Echo cancelling	SOS-EPTV29: Use Echo Protect Tone with V29	Reserved	SOS-SEUILREC: Reception threshold	SOS-NIVEMI: Transmission level			
Values	0: no 1: yes	0: no 1: yes		0: -43 dBm 1: -47 dBm	00 = 0 dBm 01 = -1dBm 06 = -6 dBm 0F = -15dBm			

SOFT-Switch 4: Fax Protocol Configuration

Bit	8	7	6	5	4	3	2	1
Use	SOS-ECM: Restricted ECM	SOS-LGINF: Maximum length of scan, printing, communication	SOS-DISINF: Unlimited DIS length	SOS-RTN: Page accept criterion		SOS-TCF: TCF accept criterion	SOS-DISCOURT: Restricted DIS size	SOS-MODPRIV: Communicat. In private mode
Values	0: no 1: yes	0: 1 meter 1: 3 meter	0: no 1: yes	0: 10% max 1: 15% max 2: 20% max 3: no check		0: normal 1: special	0: long DIS 1: short DIS	0: no 1: yes

SOFT-Switch 5: Loudspeaker Configuration

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	SOS-HP: Line monitoring during fax comm.	Reserved	Reserved	Reserved	Reserved
Values				0: no 1: yes				

SOFT-Switch 6: Line Tests

Bit	8	7	6	5	4	3	2	1
Use	SOS-TSTDCOM: Driver test functions	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Values	0: no 1: yes							

SOFT-Switch 7, 8: Reserved

SOFT-Switch 9: Approval + Communication Applications

Bit	8	7	6	5	4	3	2	1
Use	Reserved	SOS-LIGNE5S: Lines of 5sec. During reception	Reserved	SOS-NOTREMIS: Printing of first page on transmission report	Reserved	Reserved	Reserved	Reserved
Values		0: Length of lines not limited to 5sec./lines 1: Maximum length of a line 5sec.		0: no 1: yes				

SOFT-Switch 10: Communications (Locks / Miscellaneous)

Bit	8	7	6	5	4	3	2	1
Use	Reserved	SOS-SONREA: Access to redialling parameters	Reserved	Reserved	Reserved	Reserved	SOS-BTYPNUM: Access to impulse / DTMF dialling parameter	SOS-AFFVIT: Comm. Rate display
Values		0: no access 1: access					0: yes 1: no	0: no (the page number is displayed) 1: yes (the comm. Rate is displayed)

SOFT-Switch 11,12: Reserved

SOFT-Switch 13,14,15,16: Internet Functions (Not Used)

SOFT-Switch 17: Communication

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	SOS-NO-TRT-FCERROR: retry after modem high data dedect. Problem	Reserved	Reserved	Reserved	Reserved
Values				0: yes 1: no				

SOFT-Switch 18: Coding / Communication Rate

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	Reserved	SOS-CODCOM: COM negotiated encoding type		SPS-CODMEM: Stored document encoding type	
Values					01: MH encoding 10: MR encoding 11: MMR encod.		00: RL encoding 01: MH encoding 10: MR encoding 11: MMR encod.	

SOFT-Switch 19: Miscellaneous Software Function

Bit	8	7	6	5	4	3	2	1
Use	Reserved	SOS- ONETOUCH: Enable <one touch> functions	SOS- MENUCLAVER: Hide keyboard menus and force QWERTY keyboard	SOS- REIMP: Reprinting of received documents	SOS- REGULREC: T30 reception control inhibited	Reserved	Reserved	Reserved
Values		0: no 1: yes	0: no 1: yes	0: no 1: yes	0: no 1: yes			

SOFT-Switch 20: Reserved

SOFT-Switch 21: T4-T6 Decoder / Debug

Bit	8	7	6	5	4	3	2	1
Use	Reserved	SOS- DETECT OCCUP: Inhibition of engaged tone detect	Reserved	SOS-GARCAGE- FLASH: flash memory garbage collection method	Reserved	Reserved	Reserved	SOS- TRAITLIGERR: T4 decoding line copying mode
Values		0: no 1: yes		0: garbage collection when application terminates 1: garbage collection as background task ATTENTION: taken into account only after reboot of CPU				0: for each line with an error 1: only once, then destroy

SOFT-Switch 22: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	SOS-DUREE- 2100 V34: Transmission time of the 2100 modified for V34 reception	Reserved
Values							00: 5sec. 01: 4,5sec. 10: 4sec. 11: 3,5sec.	

SOFT-Switch 23: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	SOS- SORTSEND: Sorted sending via ADF	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Values	0: no 1: yes							

SOFT-Switch 24: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	SOS-SMSV23: SMS function type	SOS-SMSRECV23: Reception SMS function	Reserved	Reserved	Reserved	SMS-PROTOCOL: Used protocol for SMS	Reserved	Reserved
Values	0: SMS via V23 1: Text2Fax	0: no 1: yes				0: country dep. 1: opposite		

SOFT-Switch 25: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	SOS-DBL_ALT: Photocoupler Type for ring detection	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Values	0: single alternance 1: double alternance							

SOFT-Switch 26: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	Activation of Carrier loss in ECM mode for DTS label	Activation of fax modification for DTS label	Menu page counter present / not present	SMS service center number menus present / not present	Reserved	Reserved	Reserved	Reserved
Values	0: not active 1: active	0: not active 1: active	0: not present 1: present	0: present 1: not present				

SOFT-Switch 27: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	Chip select restore (ESD problems)	Reserved	Reserved	Reserved	Reserved	Number of busy tones	CLIP time update delta	Time update via CLIP
Values	0: no 1: yes					0: 3 busy tones 1: 2 busy tones	0: always 1: < 90min.	0: yes 1: no

SOFT-Switch 28: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Chip card clock selection	
Values							00: 1 MHz 01: 1,277 MHz 10: 1,7 MHz 11: unused (1MHz)	

SOFT-Switch 29: Miscellaneous Software Functions

Bit	8	7	6	5	4	3	2	1
Use	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	User function paper format	User function contrast
Values							0: disabled 1: enable	0: disabled 1: enable

SOFT-Switch 30: Reserved

7 MAINTENANCE FUNCTIONS

In order to use the maintenance functions, the SOS_IMPTRA switch (SOS1-Bit8) has to be setted to 1

7.1 Initialization Functions

ITEM	ACTION
Menu # 0	Default user parameters configuration (factory status) → Restart with Easy Install Directory is preserved Pages counters are preserved Consumables counters are preserved Communication log is preserved
Menu # 1	Clear directory
Menu # 2	Clear communication log
Menu # 3	Clear pages counters (If page counter SOS26 / 6 is switched ON)
Menu # 4	Clear consumables counters (Attention: after clear, Chip Card is needed)
Menu # 5	Complete “hardware” reset : functions 0 + 1 + 2 + 3 + 8 → Restart with Easy Install. This command sequence is taken into account only if printer cover is open
Menu # 6	Same as Menu # 7 but without Easy Install
Menu # 7	Functions 0 + 2 + 8 → Restart with Easy Install Directory is preserved Pages counters are preserved Consumables counters are preserved
Menu # 8	Clear document memory (received documents, documents to be sent) Clear Sending command list Clear Printing command list Directory is preserved Pages counters are preserved Consumables counters are preserved Communication log is preserved User parameters are preserved
Menu # 9	Same as Menu # 7

7.2 Other Functions

ITEM	ACTION
*	Internal system status printing (identification + T30 protocol traces + modem traces)
Menu * 1	Parameters printing (user parameters + technical parameters)
Menu * 2	Clear communication logs
Menu * 3	Not used
Menu * 4	Wait for firmware download via USB
Menu * 5	Save users parameters and directory on I2C chip card
Menu * 6	Not used
Menu * 7	Not used
Menu * 8	Not used
Menu * 9	Restore users parameters and directory from I2C chip card
Menu * E Menu * e	Display internal firmware status (applications and drivers)
Menu * M Menu * m	Display modem chip type
Menu * R Menu * r	Software reset
Menu * V Menu * v	Display firmware version and checksum on LCD
Menu * W Menu * w	White Reference
Menu * Y Menu * y	- If consumer counter value is higher than near end (6%), set counter value to 6%. - If consumer counter value is lower than near end (6%), set counter value to 1%

8 TEST FUNCTION

8.1 Purpose

The test mode is a software interface that listen for test commands received on Fax Keypad. The machine interprets these codes and initialize the corresponding action.

8.2 Enter Test Mode

First you have to set the Fax machine in the maintenance mode.

(SOS1-Bit8 has to be stetted to one)

To enter in the Test Mode press the Key combination below on the keypad:

Menu # * 0

You will enter into the Test Mode and the following messages will appear on the displays:

				T	E	S	T	M	O	D	E				

ATTENTION: After you have entered in the Test Mode the first Test you have to carry out, is the Test 100 Param. 00 (INIT Test Mode).

8.3 Display

The content of the display has following format:

Y	Y	Y		T	E	S	T	M	O	D	E			X	X

YYY ... Shows Running Test or last test

XX ... Shows Result of last test

8.4 Keys used on Fax Keypad in Test Mode

- **START** Test Ok or Test start
- **STOP** Test failed or Test aboard
- **KEY 0-9, *, #** Input Test number

8.5 Aboard Test

For all Tests is the possibility with the STOP key for to aboard the test foreseen.

8.6 General Description of a Test-Step

All test flows are described in the form outlined. The field *Step* is for orientation in case of Jumps, *Status* is for decisions, *Operator* describes the actions of the Operator, *UUT* describes the actions for the Fax machine, *Display* shows the Text during a Test, and *Remarks* is for added Information.

Step	Status	Operator	UUT	Display	Remarks
1	OK		Wait	XXXXXXXXXX XXXXXXXXXX	
2	NOK	Do			Info
3	Repeat		Do		
4					

A short Test-description and Pass-criteria is also included in a Test-step.

8.7 Short Overview of Tests for Service

Test number	Test name	Parameter	Remark
100	INIT Test mode	YES	Save Consumer counter
103	Cradle	No	
108	Speaker	No	
109	Keys	No	
110	LCD/Icons	No	
111	LED	No	
112	Sensors	No	
120	Fan Test	No	
136	End Test mode	No	End test, restore Consumer counter, delete doc's, start USERMODE

8.8 Description of Test for Service

8.8.1 INIT Testmode (Test-Code 100)

This function is for initializing the TEST MODE if the Fax machine was in USERMODE.
Input Code **100** and then the parameter **00**.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in TEST MODE	TESTMODE	
2		Enter Command			Keypad: 100
3			Receive Command, clears all buffers, initialized all relevant drivers and variables, set all test to FF (means tests not done)	ENTER TEST 100	
		Enter Parameter			Keypad: 00
4	OK		Set Resultbyte to 00	100 TESTMODE 00	
5	NOK		Set Resultbyte to XX	100 TESTMODE XX	XX...Errorcode

Pass:

No errors occurred during Init Testmode

Resultbyte:

00 ... Test done and OK

FF ... Test not done

80 ... Operator pressed <STOP>

XX ... Error code

Remark:

Initialize Toner counter to 20% for making printing tests.

8.8.2 Speaker (Test-Code 108)

For test the right connection of speaker or buzzer, the UUT sends a tone. This tone works with the highest volume.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and waits for command	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter command			Keypad: 108
3			UUT waits for <START>	SPK TST	
4		Press <START>	UUT plays a tone		
5		Check the tone			
6	OK	Press <START>	Set Resultbyte to 00	108 TESTMODE XX	XX = 00 and no anomaly occurred
7	NOK	Press <STOP>	Set Resultbyte to XX	108 TESTMODE XX	XX <> 00 or anomaly occurred

Pass:

The sounds are clear to hear and the operator pressed <START>.

Resultbyte:

00 ... Test done and OK

FF ... Test not done

80 ... Operator pressed <STOP>

8.8.3 Keys (Test-Code 109)

The examining staff presses all buttons in the order defined below. The button to be pressed as next is shown at the display. Exactly the button which is shown at the display may always only be pressed. Another button is pressed this keystroke is ignored (exception: the standard button for bad serves for the demolition of the sequence). Was a keystroke is accepted as long as maintained till the button is let off again. If several buttons are pressed at the same time, the code of the first button is always read. This has the consequence that the second button is never evaluated as pushed. The examining staff is asked to enter the result of the button test over the display at the end of the sequence. According to the result the examining staff presses the standard buttons for OK/NOK.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and wait for command	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad: 109
3			UUT shows the Key for checking and wait for pressing	OPU KEY: xxx	xxx... next Key to be pressed
4		Press shown Key	Shows and wait for the next key - Go to Step 3 or next step if a error occurred or the last key was shown		
5		Press <START>	Set Resultbyte to XX	109 TESTMODE XX	XX = 00 and no anomaly occurred XX > 00 or anomaly occurred

Pass:

All Keys possible to press, no anomalies occurred

Resultbytes:

00 Test ok

FF Test not done

All other bit combinations means error (anomaly occurred).

Key Sequence:

<A-Z>, <i>, <<->, <OK>, <->, <Fax Mode>

<q>, <w>, <e>, <r>, <t>, <y>, <u>, <i>, <o>, <p>, <←>
 <a>, <s>, <d>, <f>, <g>, <h>, <j>, <k>, <l>, <.>, <Enter>
 SHIFT+<Z>, <x>, <c>, <v>, , <n>, <m>, < >, CTRL+<@>

<SMS>, <Redial>, <R>, <Dial>

<1>, <2>, <3>, <4>, <5>, <6>, <7>, <8>, <9>, <*>, <0>, <#>

<Res.>, <Copy>, <Clear>, <Stop>, <Start>

8.8.4 LCD / Icons (Test-Code 110)

The assessment of the LCD is visually made by the operator. According to the assessment the examining staff presses the standard buttons after every test step for good/bad. The input is possible only after a time of 0.5 .The cursor is turned off at all tests.

Black Dots

I.e. on all portrayable signs it is written to 0 xFF all points are steered for with the exception of the icons.

Blank display

I.e. on all portrayable signs it is written to 0 x20 all points are turned off.

CG RAM/icons

The LCD is represented a sign with a matrix of 5 columns and 7 lines. 8 signs can be generated in the CG RAM.

Describing CG RAM

The signs must be generated in the CG RAM first:

- 1st sign (1): only the 5 points of the undermost line (7th lines) are steered for,
- 2nd sign (2): only the points of the 6th line are steered for,
- 3rd sign (3): only the points of the 5th line are steered for,
- 4th sign (4): only the points of the 4th line are steered for,
- 5th sign (5): only the points of the 3rd line are steered for,
- 6th sign (6): only the points of the 2nd line are steered for,
- 7th sign (7): only the points of the 1st line are steered for,
- 8th sign (8): only the points of the 7th line are steered for.

Distributing CG RAM

The signs become the distributed CG RAM in the following order at the display:

- The line 1 LCD: Signs 1, 2, 3, 4, 5 6 7 7 7 7 6 5 4 3 2 1,
- Line 2: 7, 6, 5, 4, 3, 2, 1, 8, 1, 8, 2, 3, 4, 5, 6, 7 .

Icons

All icons with the exception of the 5th icon (filling level advertisement ink cartridge) are steered for. For the time being only the frame is represented at the 6th icon (ink point marking film advertisement) (0 x5F). You a point of the icon then represent at the 6th icon in addition to the frame cyclically exactly the waiting time between every change is 0.3 s. From this the cycle gives up for the 6th icon: 0 x5F, 0 x2E, 0 x79, 0 x42.

Sign

(0 x48) are written to, X, on all portrayable signs.

Controller check

(0 x8A) are written to, o, on all portrayable signs.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and wait for command	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad: 110
3			Wait for <START>	LCD TST	
4		Press <START>			
5			Show Black Dots and wait for input		
6	OK	Press <START>			
7	NOK	Press <STOP>			
8			Show blank display and wait for input		
9	OK	Press <START>			
10	NOK	Press <STOP>			
11			Write Chars in CG-RAM		
12			Show chars from CG-RAM and wait for input		
13	OK	Press <START>			
14	NOK	Press <STOP>			
15			Show icons and wait for input		
16	OK	Press <START>			
17	NOK	Press <STOP>			
18			Show all X and wait for input	XXXXXXXXXXXXX	
19	OK	Press <START>			
21	NOK	Press <STOP>			
22			Show all o and wait for input	oooooooooooooooo	
23	OK	Press <START>		110 TESTMODE XX	XX = 00 and no anomaly occurred
24	NOK	Press <STOP>		110 TESTMODE XX	XX <> 00 or anomaly occurred

Pass:

All Tests ok, no anomaly occurred.

Resultbytes:

00 Test ok

FF Test not done

All other bit combinations means error (anomaly occurred).

8.8.5 LED (Test-Code 111)

The LED's are switched on and off in cycles of 0,5sec.

The assessment of the LED is visually made by the examining staff. According to the assessment the examining staff presses the standard buttons for OK/NOK. The input is possible only after a time of 0.5 sec.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and wait for command	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad: 111
3			Set/clear LED after each other	LED TEST	
4	OK	Press <START>	Set Resultbyte to 00	111 TESTMODE XX	XX = 00 and no anomaly occurred
5	NOK	Press <STOP>	Set Resultbyte to XX	111 TESTMODE XX	XX <> 00 or anomaly occurred

Pass:

All Tests ok, no anomaly occurred.

Resultbytes:

00 ... Test ok

FF ... Test not done

80 ... Operator pressed <STOP>

8.8.6 Sensors (Test-Code 112)

Checks the Cover Sensor and the Paper-Cassette sensor.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and wait for command	YYY TESTMOD XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad: 112
3				SEN TST	
4			Checks Paper Cassette sensor	REMOVE PAP CASS	
		Remove Paper Cassette		INSERT PAP CASS	
5		Insert Paper Cassette	Checks Paper Cassette sensor	OPEN PRT COVER	
6		Open Printer Cover	Checks Cover sensor	CLOSE PRT COVER	
7		Close Printer Cover	Checks Cover sensor	WAIT PRT READY	
9	OK		Set Resultbyte to 00	112 TESTMODE XX	XX = 00 and no anomaly occurred
10	NOK		Set Resultbyte to XX	112 TESTMODE XX	XX <> 00 or anomaly occurred

Pass:

Resultbytes:

00 ... Test ok

FF ... Test not done

All other bit combinations means error (anomaly occurred).

8.8.7 Fan (Test-Code 120)

Checks the function of the fan

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in Testmode and wait for command	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad: 120
4		Open and close printer cover	Switch fan on and wait for input	FAN TST	
5		Check function of fan by hand			.
7	OK	Press <START>	Set Resultbyte to 00	120 TESTMODE 00	XX = 00 and no anomaly occurred
8	NOK	Press <STOP>	Set Resultbyte to XX	120 TESTMODE XX	XX <> 00 or anomaly occurred

Pass:

All Tests ok, no anomaly occurred

Resultbytes:

00 Test ok
FF Test not done
80 ... Operator pressed <STOP>

8.8.8 EXIT Testmode (Test-Code 136)

This function exit's the TEST MODE if the Fax machine is in TESTMODE. After exit the Fax machine is in USERMODE.

Flow:

Step	Status	Operator	UUT	Display	Remarks
1			Is in TESTMODE	YYY TESTMODE XX	YYY...last Testcode XX...Errorcode or 00
2		Enter Command			Keypad_ 136
3			Receive Command, clears all buffers, initialized all relevant drivers and variables for Usermode	END TEST	
4			Restart of machine in Usermode		

Pass:

No errors occurred during Exit Testmode.
All variables set for User.
No garbage in Memory.

9 ERROR CODES

The error codes are divided in three groups. One group is responsible for the fax functions the second group for the SMS feature (Country dependent) and the third for the printer. If an error occurs during the transmission you will be informed by the error report which is printed out. This list can be separated printed out by pressing M 42 and then the OK button.

9.1 FAX ERROR Codes:

Fax error codes	Description
00	No error.
01	Destination number not answering.
02	Destination number is burned.
03	User pressed the STOP key.
04	Wrong key pressed.
05	Scanner error.
06	Printer error.
07	Protocol error.
08	Check the document quality.
09	No document on the polled device.
0A	The device was polled but there were no document.
0B	Number of sent pages different from input number.
0C	Received document too long.
0D	Receiving failure.
0E	No file or corrupted file to be sent.
0F	Document coding incompatible with the receiver.
10	Document format incompatible with the receiver.
11	Protected access.
12	Printer resource not available.
13	Memory full.
14	Printing queue full.
15	No mailbox on the receiver.
16	No forwarding group on the receiver side.
17	No base on the distant device.
18	Forwarding unavailable.
19	Transmission stopped by the distant device.
1A	Training rejected by the distant device.
1B	ACEE coding/decoding default.
1C	Distant device is not a fax device.
1D	Telemaintenance not available on distant device.
1E	Telemaintenance rejected by distant user.
1F	Keyboard resource not available.
20	Telemaintenance stopped by user.
58	Distant device is not a fax device.
59	T30 stopped on NoID event.
5A	Paper jam during receiving.
5B	Telephone number is burned. The fax tries the next one.
5C	Unknown event to T30.
5D	CnxID was received while going on-hook.
5E	Unknown distant device answer.
60	Scanner resource not available.
61	Automatic dialing not available.
62	Unknown software crash.
63	Distant device is busy.
64	Transparent mode handshake failed.

9.2 SMS ERROR Codes (Country dependent):

Value	Error	What you can do
00	No error	
01 – 09	Server errors (Protocol 2)	Check if the user has subscribed to the service. Check if the SMS destination number type is handled by the SMS provider.
10 – 16	Low level errors	Check the service center numbers in the device
20 – 30	Protocol errors	Check the service center numbers in the device
41	Memory full	Check the number of received SMS.
50	Communication error	
60	User stop	
61	Wrong service center number	Check the service center numbers in the device
62 – 68	Line errors.	Check if the device is correctly plugged to the telephone network.
70 – 74	Server errors (Protocol 1)	Check if the user has subscribed to the service if required by the provider. Check if the SMS destination number type is handled by the SMS provider.

9.3 PRINTER Display Messages

Message on Display	Message Type	Description
CLOSE PRINTER COVER	STATUS	CLOSE PRINTER COVER
PAPER EMPTY REFILL PAPER	STATUS	REFILL PAPER CASSETTE
PAPER JAM REMOVE PAPER	ERROR	PAPER-INPUT JAM
PAPER JAM NB 2 REMOVE PAPER	ERROR	PAPER-CENTER JAM
PAPER JAM NB 3 REMOVE PAPER	ERROR	PAPER-EXIT JAM
PAPER FEED REPLACE PAPER	ERROR	PAPER MISS FEEDING
CHECK PRINTER: 01 RESET DEVICE	ERROR	FUSER TEMPERATURE TO HIGH
CHECK PRINTER: 02 RESET DEVICE	ERROR	FUSER TEMPERATURE TO LOW
CHECK PRINTER: 04 RESET DEVICE	ERROR	POLIGONE MOTOR ERROR
CHECK PRINTER: 05 RESET DEVICE	ERROR	SYNCRONISATION OF LASERBEAM FAILED
PAPER SIZE REPLACE PAPER	ERROR	WRONG PAPER SIZE
HEATING PLEASE WAIT	STATUS	
INSERT TONER TONER LOW	STATUS	REPLACE TONER

10 FIRMWARE UPGRADING WITH PC KIT V1.1 (WINDOWS 2000 / XP)

10.1 To launch the utility:

- Command line : TelUSB2 [Full path of the binary file to upload]



- Double click on the TelUSB2.exe icon
- Double click on the binary file to upload (.bin files need to previously be associated with TelUSB2.exe in Windows Explorer).

TelUSB2 always gives the current state of the device. The utility is registered to the system to be notified when the device is plugged or unplugged or when the mode of the device changes. You do not need to restart the utility after plugging or after switching mode.

10.1.1 States:

- No USB MFL/C5 device detected
Device is not switched on or USB wire is not plugged in.
- MFL/C5 in standard mode. Switch to upload mode.
Device is in normal mode. You need to switch for upload mode before proceed.
- MFL/C5 ready for upload
Device is ready to proceed.

If TelUSB2 is launched by specifying a file name as command line parameter or by double clicking on a binary file, the utility will automatically try to upload the file. Then, if the file is successfully uploaded, the utility will be automatically closed. If upload failed (device not plugged or not ready) you can retry by clicking the upload button.

10.2 To select a binary file to be uploaded:

- You can specify its full path in command line parameter (automatic upload mode).
- You can double-click on a binary file (.bin file needs to be previously associated with TelUSB2.exe in Windows Explorer) (automatic upload mode).
- You can drag and drop a file from the Explorer to the TelUSB2 utility.
- You can use the “Browse” button.
- You can directly write the full path of the file in the edit filed.

10.3 To start upload:

1. Copy the Software for Firmware update (Teleloader) on your PC to the local drive.

2. Activate the service function as follow, press on your machine Menu * #.

Display show:

1> SOS1
2 SOS2

3. Confirm with OK and the display show:

SOS1
00100001

4. Press the key 1 to change the Bit 8 from 0 to 1, to activate the service function.

Bit 8 —→

SOS1
10100001

5. Confirm with OK and then press STOP to exit.

6. Press MENU * 4 to activate the TELELOADING function.

Display show:

TELELOADING
IN PROGRESS

7. Start the program TelUSB2.exe for example with double click on the Teleloader icon.



8. Following windows can appear on the PC screen (see figure 1 / 2).

A.)

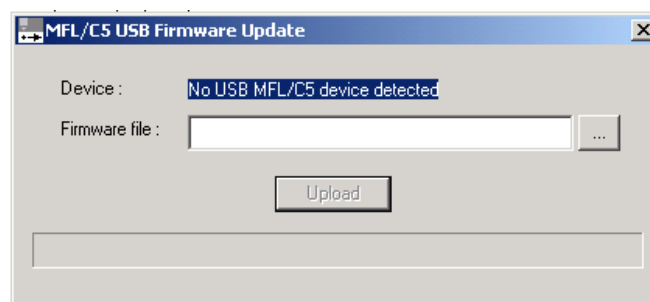


Fig. 1

No “USB MFL/C5 device detected”, means device not connected to PC or connected but without power or.

B.)

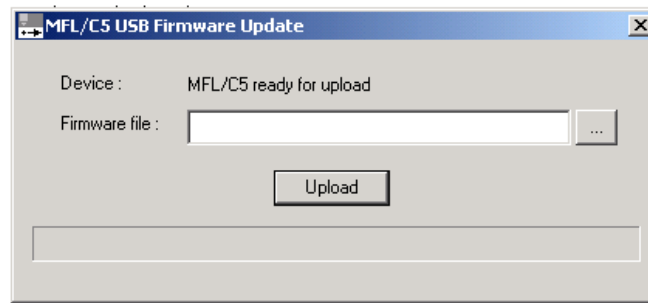


Fig. 2

“MFL/C5 ready for upload” means the device is ready for firmware upgrade

9. Press the Browse Button  to select the location of the Firmware Binary file

10. Press the Upload Button and the upload will start.



Fig.3)

You will get the message above in case of a successfully upload (see figure 3).
After a while the device will continue with a reboot and starts with the easy install procedure.

11. Go through the easy install procedure to finish the update process.

12. Make a “ White Reference (Menu * W) “ adjustment.

11 Customisation of the Device

11.1 Introduction

This chapter describes the procedure of setting the customization on a device.

It provides information about working with customizations and further information about them.

All the following operations are done in an active Shell/Prompt like the MS-DOS-Prompt which is used under Windows 98. The commands have to be typed and executed in the *Commflag* directory to work properly. The customization must be also done if you swap a mainboard with a new one in case of a repair.

11.2 Commflag

For uploading the customization to the device, the software *Commflag* is needed.

11.3 Communicating with the Device

The communication with the device is done via an USB cable (as usual). The difference is the used program *Commflag*.

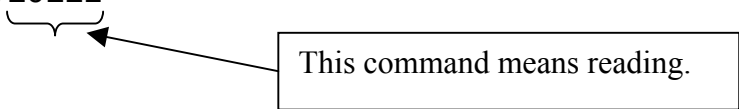
To make the device ready for the process, it has to be entered in the test mode. Activating the Bit switch SOS1 Bit 8 does this. To enter in the test mode press the key combination **Menu # * 0**.

To prevent a toner counter reset, Test Code 100 with Parameter 00 must be inserted before uploading a new customization file. Now the device is ready for communication.

11.4 Reading the customization of a Device

For reading the customization use the following command:

```
commfl #10112
```

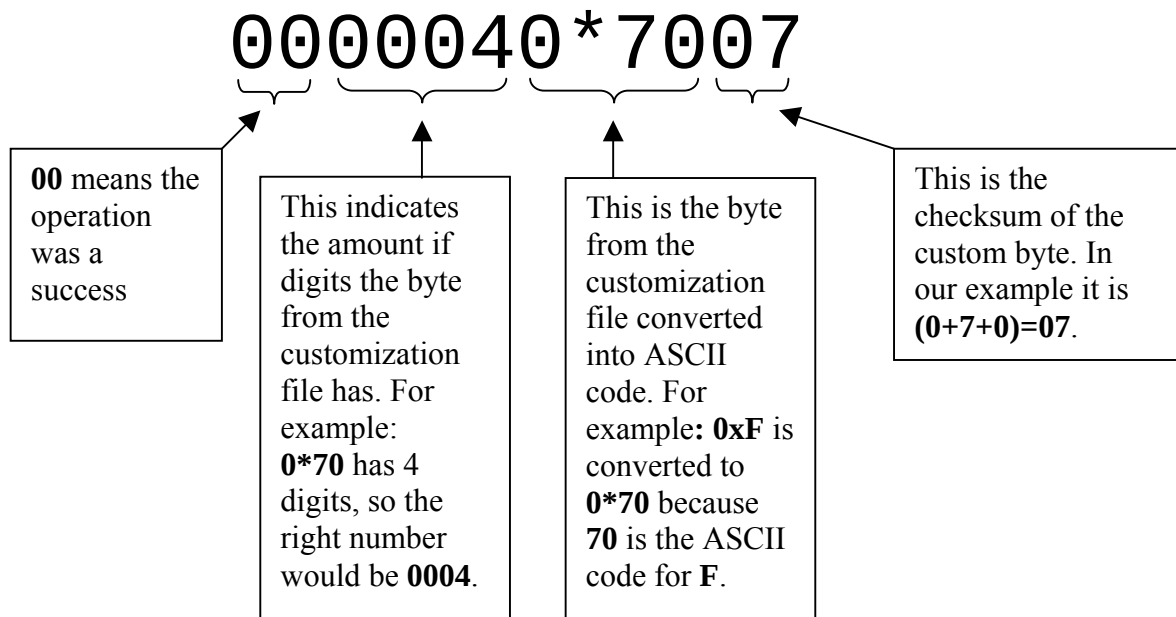


This command means reading.

Then the output should be like this:

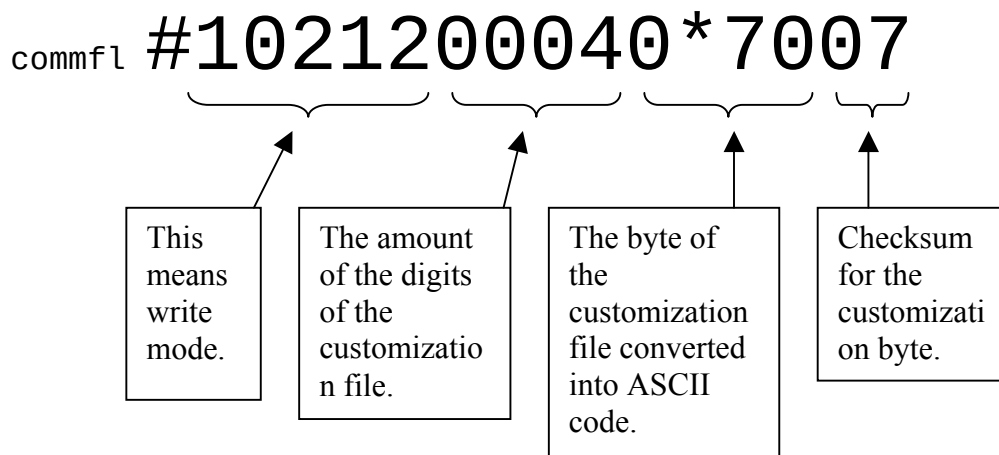
```
Sending #10112 ...  
#10112 sent.  
Reading ...  
Returned: 0000040*7007
```

The return value is interpreted in the following sequence:



11.5 Uploading the customization to a Device

The upload is done with *Commflag* too. The command is very similar to reading:



Then there will be an output like this:

```
#1021200040*7007 ...  
#1021200040*7007 sent.  
End of mission  
Reading ...  
Returned: 00
```

00 means the operation was successful.

The table below (Tab.1) shows all the different customizations that currently exist. The most interesting values are there the ASCII code (for the value to be transmitted) and the shortcut (for the automatic upload program).

Table 1: Customization sets

File 2	Hex code	ASCII code	Shortcut	Calculated code
L2_OKIFAX_b.bin	0xA	0*65	sab	00040*6511
L2_OKIFAX_c.bin	0xB	0*66	sac	00040*6612

11.6 Leaving the test mode

To exit the test mode, enter 136 on the device. The Device will reboot and prompt with the country selection.

11.7 Commflag Batch File

There exists an addition to *Commflag* that automates parts of the process. To use this batch file it has to be present in the *Commflag* directory. To work with this batch file the L2 has to be in test mode.

11.7.1 Checking the current customization

The command:

```
commflag check
```

shows the active customization. The output is very similar to the output described in “Reading the customization of a Device”. To decide if the current customization is correct, please refer to [Table 1] and compare with the column “Calculated code”.

11.7.2 Activating a new customization

The syntax for activating a customization is:

```
commflag upload <shortcut>
```

The new customization will be uploaded. The required shortcut can be found in the table above [Table 1].

11.7.3 Leaving the test mode via the batch file

There exists two ways to exit the test mode. The simple ones are these:

```
commflag quit
```

or

```
commflag -x
```

The more advanced way is a combination with the upload and check command. Only attach a -x at the end of the command. These are two examples:

```
commflag check -x
```

or

```
commflag upload <shortcut> -x
```


III Service

In this Chapter you can find

- Illustrated disassembly
- PCB-Architecture and descriptions
- Technical data
- Spare part list

12 DISASSEMBLY

Warning!

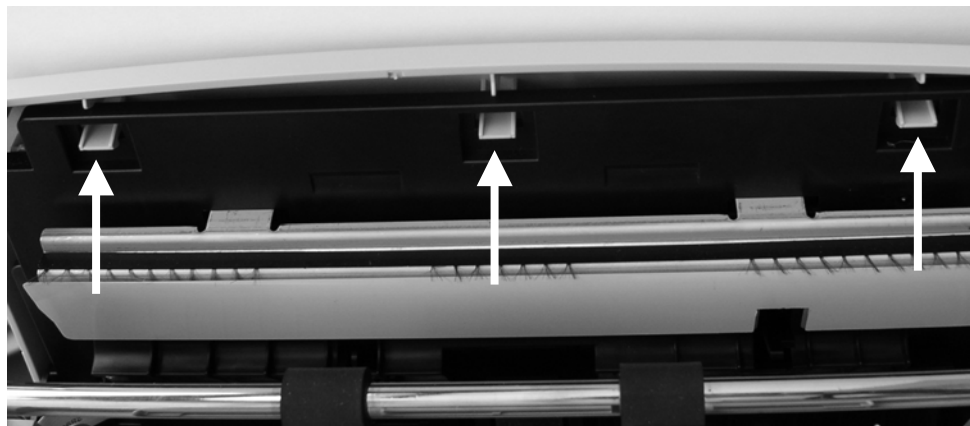
Disconnect the Power from the set before removing any cover!
Remove all accessories from the set.

12.1 Remove Operation Panel

1 Open the panel



- 2 Press the 3 snaps on the front underside of the panel
- 3 Push the panel forward to unclip the hinges
- 4 Remove the OPU cable



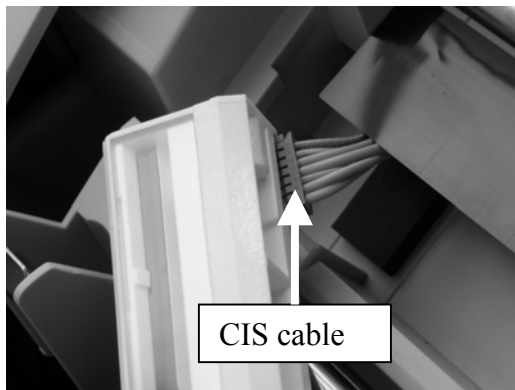
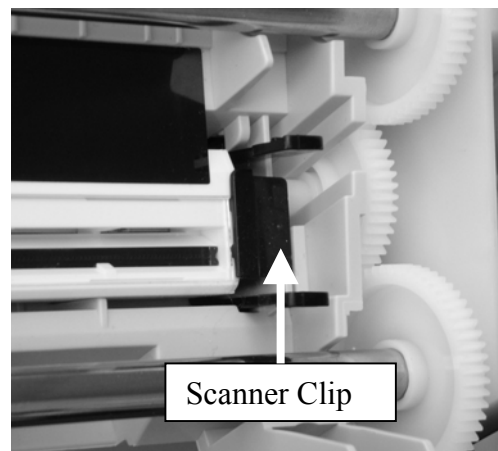
12.2 Remove Upper Guide Assy

- 1 Press the left guides
- 2 Lift the left side of the Upper Guide Assy up, to unclip the suspensions
- 3 Move the part to inside direction to unclip the right nose



12.3 Remove Scanner

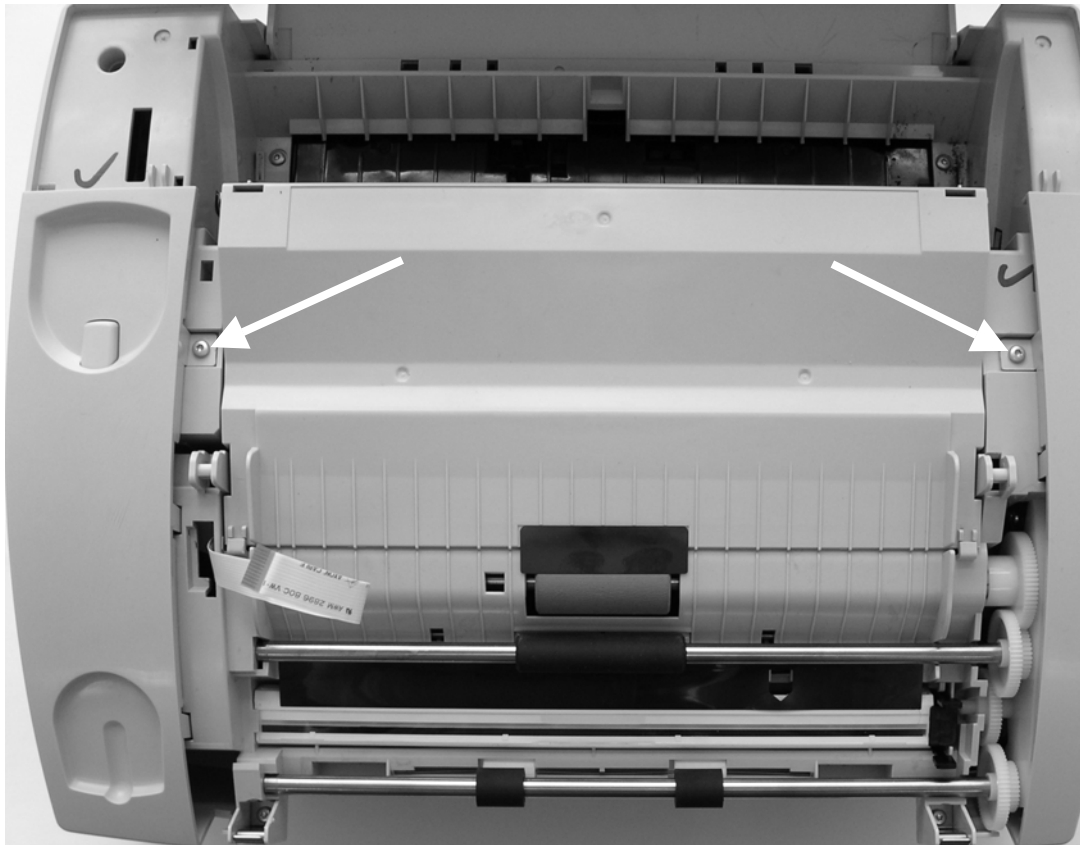
- 1 Press and remove the scanner clip
- 2 Lift the CIS carefully



- 3 Disconnect the CIS cable
- 4 Lift the CIS and check the scanner foil

12.4 Remove Main Cover

A.) Remove Handset Cover and Right Cover



1 Remove 2 screws of the Right Cover and the Handset Cover

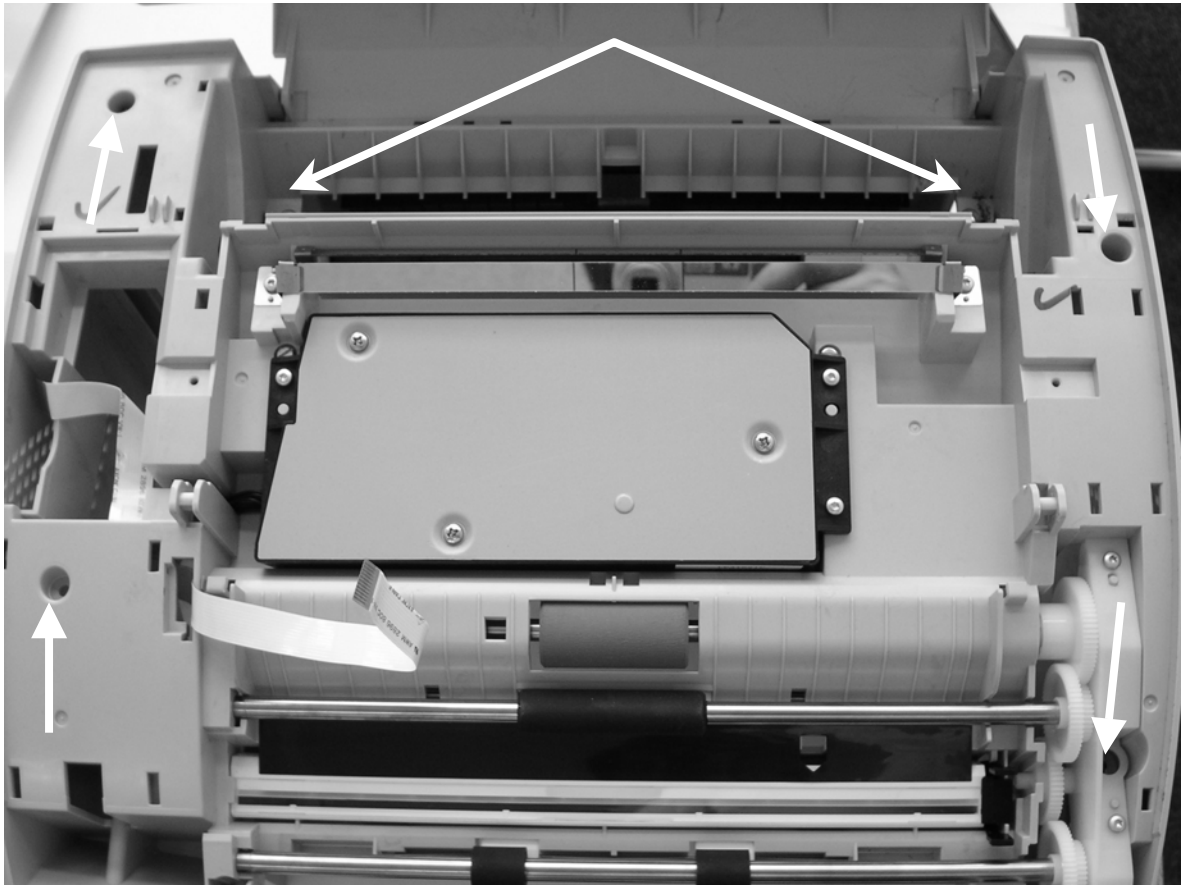


2 Remove the Handset Cover with pressing the 2 snaps

3 disconnect the Hook switch cable from the main board (if the machine type with Handset)

4 The same to remove the Right Cover, press the 2 snaps to remove

B.) Remove Top Cover Main Housing



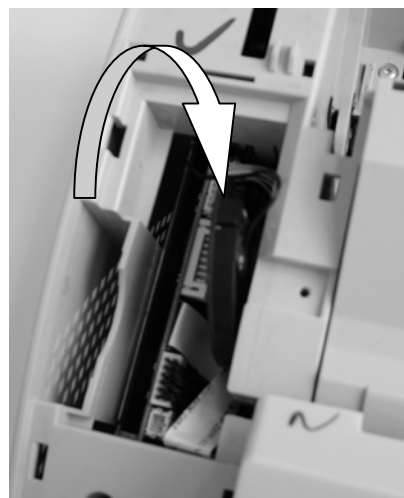
1 Remove 4 screws (see the figure), and 2 screws inside the machine (under the toner)

2 Lift the Loudspeaker and put it on the side of the Main board

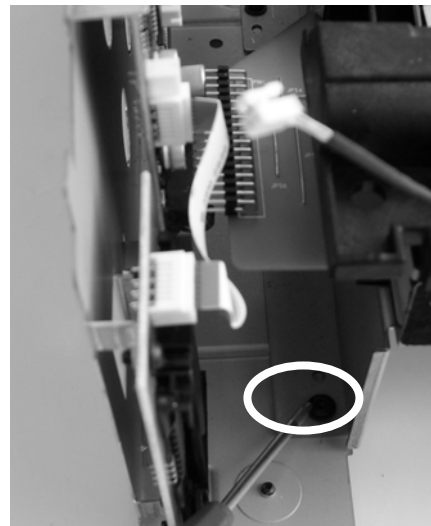
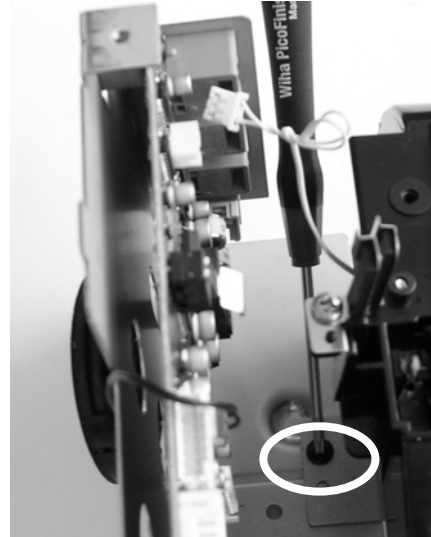
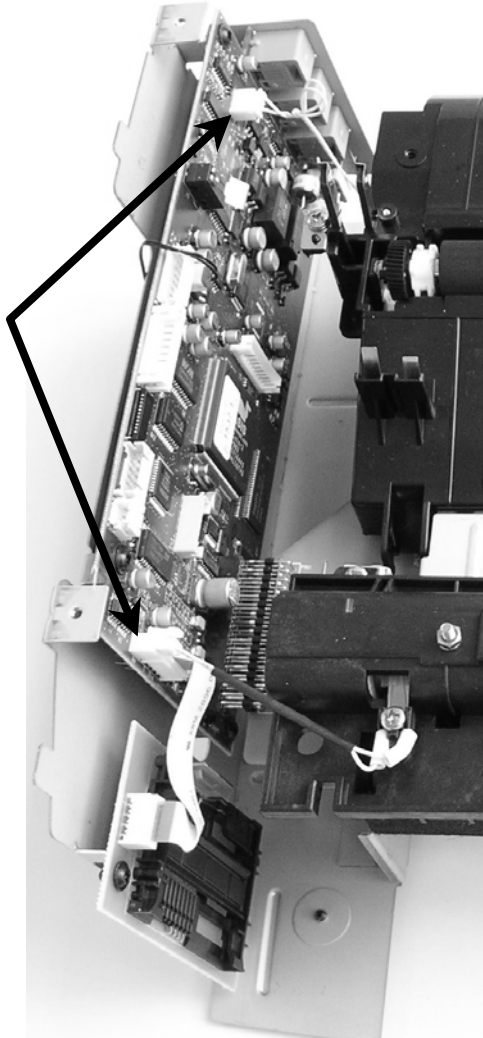


3 Disconnect the LSU cable to the main board

4 Lift the Main housing up

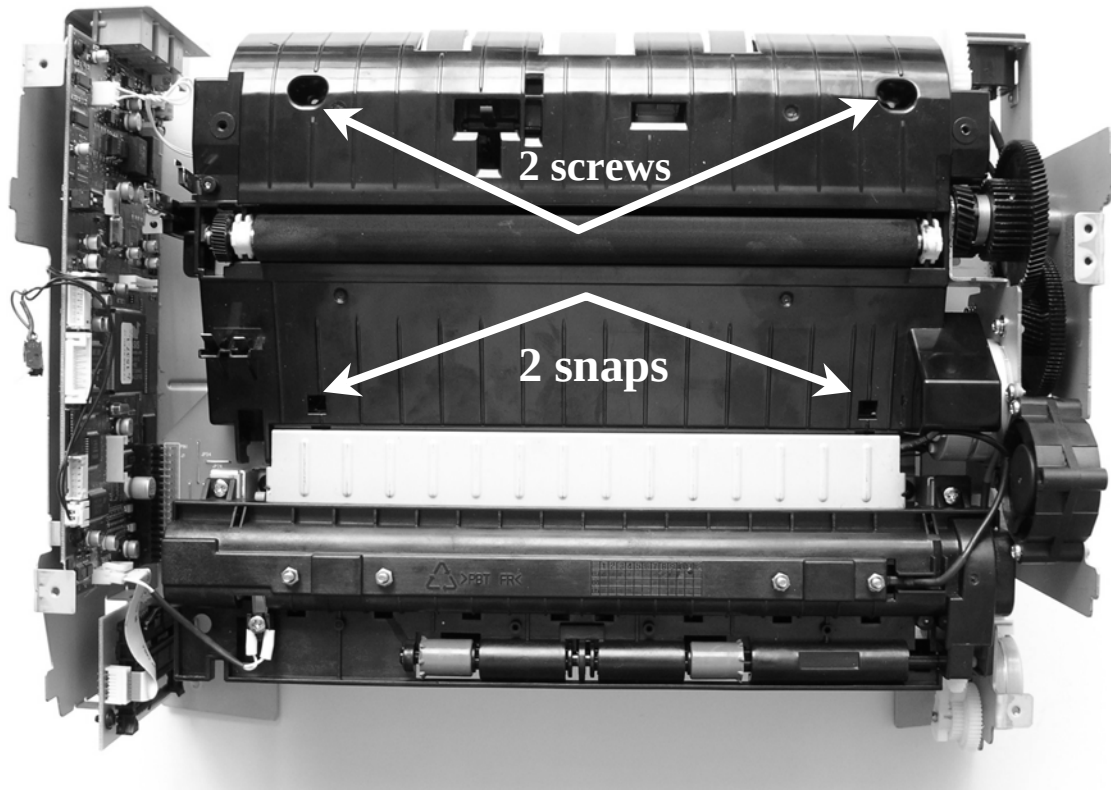


12.5 Remove Main Controller PCB



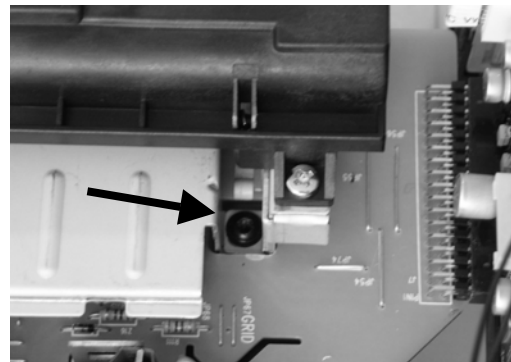
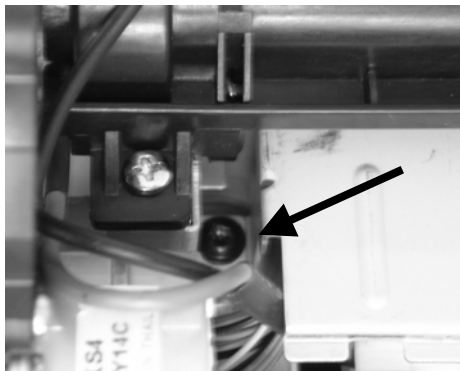
- 1 disconnect thermistor cable and Hook switch cable
- 2 Remove 2 screws from the bottom of the Main controller Bracket

12.6 Remove Pick Up Module



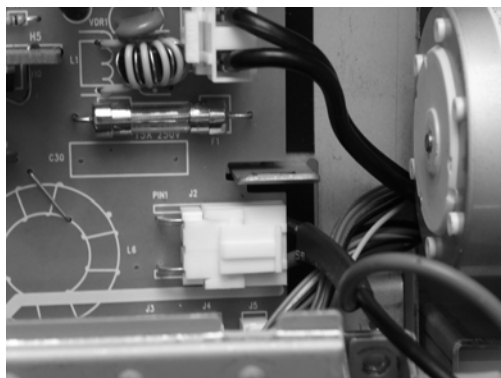
- 1 Remove 2 screws and 2 snaps (see fig.)
- 2 Lift the Pick up carefully
- 3 Disconnect the solenoid cable to the PSU

12.7 Remove Fuser Unit



1 Remove 2 screws

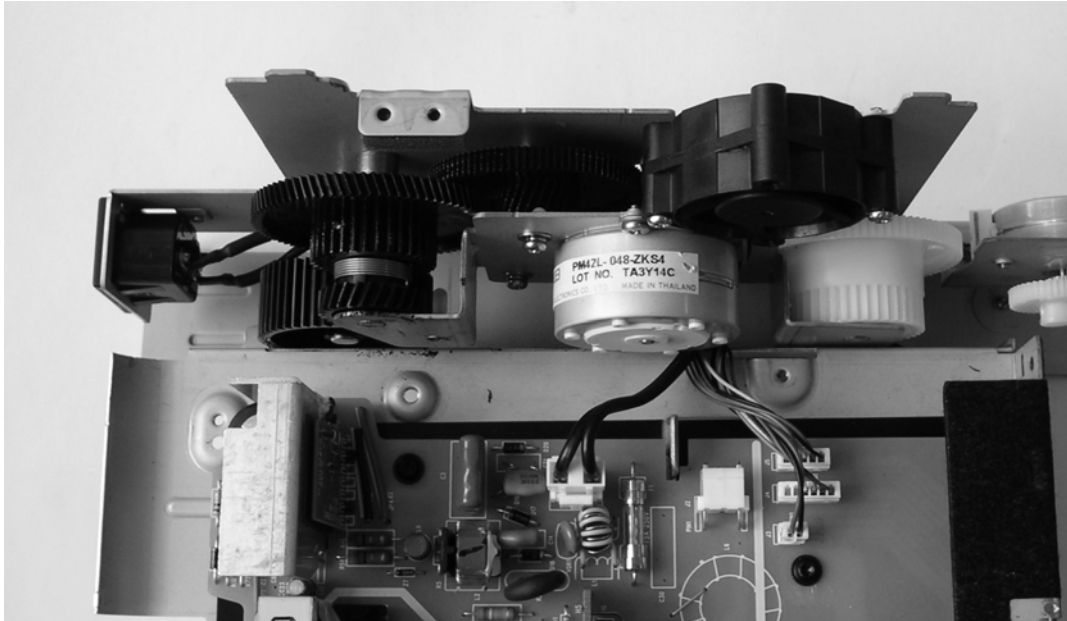
2 Lift the Fuser from the backside to unfix the nose on the front carefully



3 Disconnect the Fuser connector to the PSU

12.8 Remove Drive Module

- 1 Disconnect 4 cables to the PSU
- 2 Remove 2 screws on the bottom of the Bracket of Driving module
- 3 Remove the ground screw



13 HARDWARE ARCHITECTURE

13.1 OBJECT

Introduction

This document is the specification for Mainboard L2 Laserfax.

13.2 FUNCTIONAL DESCRIPTION

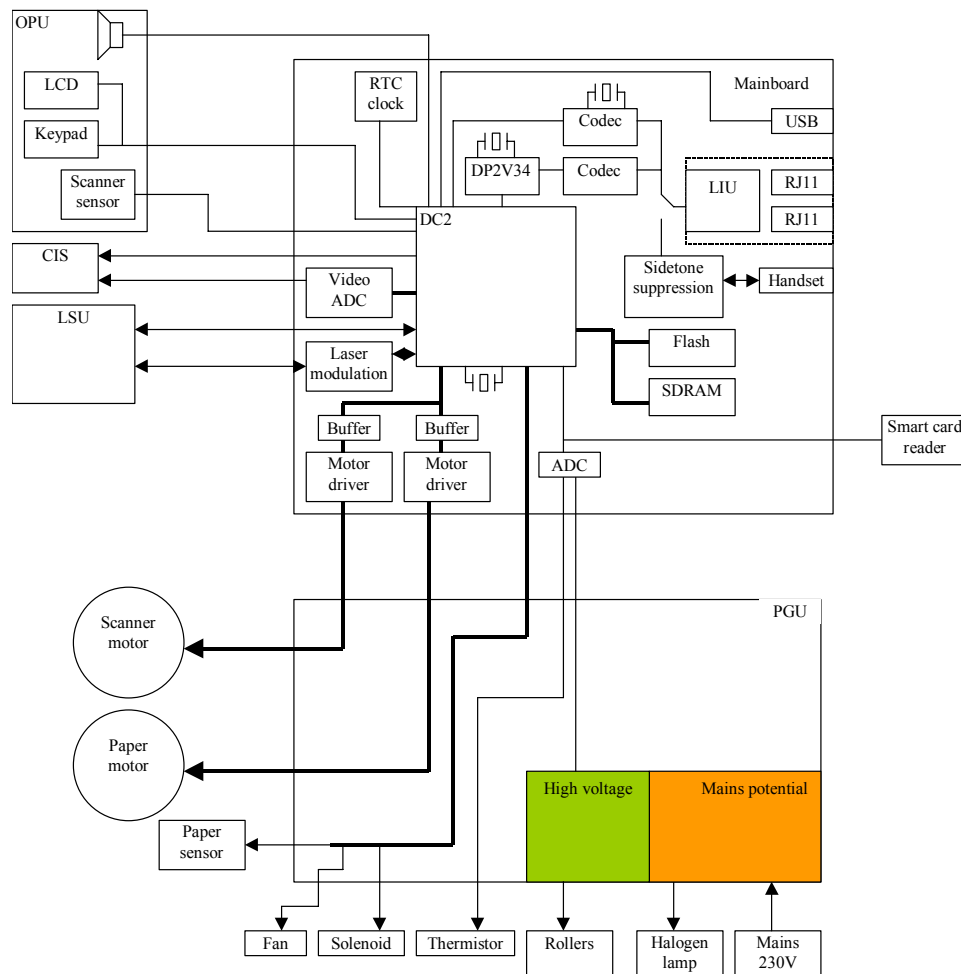
General Purpose

This document describes the hardware architecture for L2 laser fax. The core is based on Digicolor2 ARM9 & video processor.

Four equipment of the same PCB are planned:

- L2 low end: 14,4k Softmodem, no voice
- L2 low end voice: 14,4k Softmodem, corded handset
- L2 High end: 33,4k hard modem
- L2 High end: 33,4k hard modem, corded handset

13.3 Block diagram



13.4 Digicolor2

Microprocessor

Internal Core for digicolor2 is a RISC ARM 946E.

Features:

- 32 bits internal architecture
- 2 external data bus
- Memory bus 16 bits data, 24 bits address max.
- Flash code 8 bits (8Mb max).
- Sdram 8 bits (256Mb max.) / 16 bits (512Mb max.)
- Peripheral bus 8 bits data / 24 bits address (16Mb max. by nCS), or 16 bits data / 15bits address bus (64Kb max. par nCS, A0 = 0). bus width (8 bits / 16 bits) programmable for each chip select. DIGICOLOR2 provide 4 chip select for peripheral bus.
- - Power supply 2.7 - 3.3V
- Frequency: internal frequency 92Mhz.
- Access cycle are programmable for each Chip Select
- No external ready signal management.

System controller

System control is handled by DIGICOLOR2

DIGICOLOR2 manages the following functions:

- Decoding of SDRAM memory space and interface for SDRAM memory.
- Decoding of Flash code memory space.
- Decoding of peripheral bus memory space

During the boot sequence, the compressed code stored into the Flash memory is copied and expanded into the SDRAM to be executed.

Timers

4 timers 32 bits for general use are available into the Digicolor2. Timers are derived from the main clock digicolor2.

Serial links

DigiColor2 has been extended to include two independent serial receiver / transmitters. Each is able to operate either synchronously or asynchronously. The USARTs include programmable baud rate generators and 16 byte send and receive FIFOs.

A third serial link is dedicated to chip card ISO7816.

1) USART 0:

This synchronous link is used to control the OPU: LCD and keypad.

- RXpan, TXpan, Sclkpan

2) USART 1:

This link is used as a serial link to control the Dect base.

3) Chip card serial link:

The serial link ISO7816 for chip card is multiplexed with the ADC interface.

I/O mapping

The complete pixel bus port can be configured as pixel bus or as GPIO. In this case, the pin PO_DATA0 is used for sending the video signal to the laser unit, so the pins PO_Data7:1 can not be used for any other function.

GPA[7:0] is also interrupt interface.

GPB[7:0] :

- GPB[2..0] are reserved for the serial link USART0
- GPB1 = RX0, GPB0 = TX0, GPB2 = SCLK0 (Even in asynchronous mode GPB2 can't be used as an I/O)

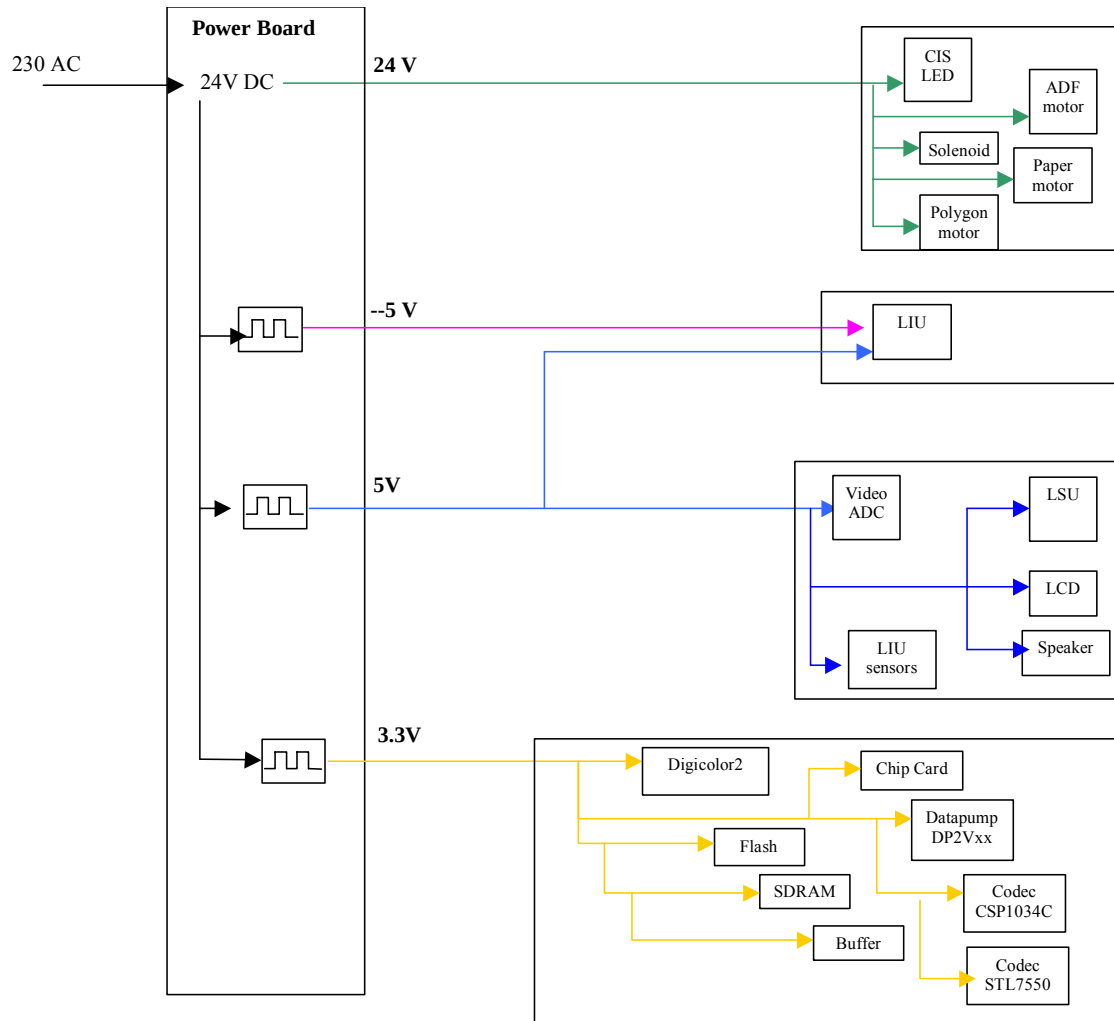
GPC[7:0]:reserved for peripheral bus address (PB_addr[7:0]).

GPD[6:0]

- GPD[5:0] are configured as ADC interface. When the signal FERCAP is active, the interface is reconfigured for Chip Car. If the CPAD signal it is not used for chip card function in this mode, he can't either be used as an I/O.
- GPD[6] is independent and used as an I/O.
CLK_EXT: This pin is sampled during the assertion of chip reset. A pull-down resistor assert a "0" so internally generated clocks will be used. After exiting reset, this pin is configured to output. Clk_Ext pin can be driven with an internally generated clock waveform or static value.

13.5 Power Supply

Power supply connections (external power supply)



Power save mode

To reach the lowest possible power consumption some parts are switched off or set to low-power mode.

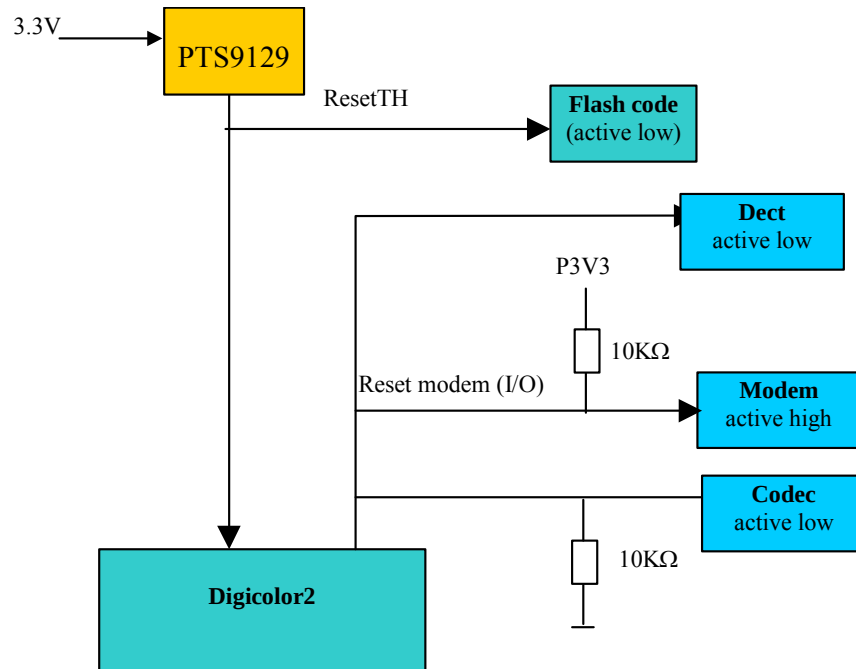
During power save mode, the following parts are switched off:

- Paper motor driver
- LSU and polygon motor
- OPU
- Loudspeaker amplification
- Paper sensors
- ADC Z350

13.6 Reset

Reset is generated by a PTS9129 (Z11) reset IC from Mitsumi. The reset level is 2.93V.

Active reset time 240ms (typ).



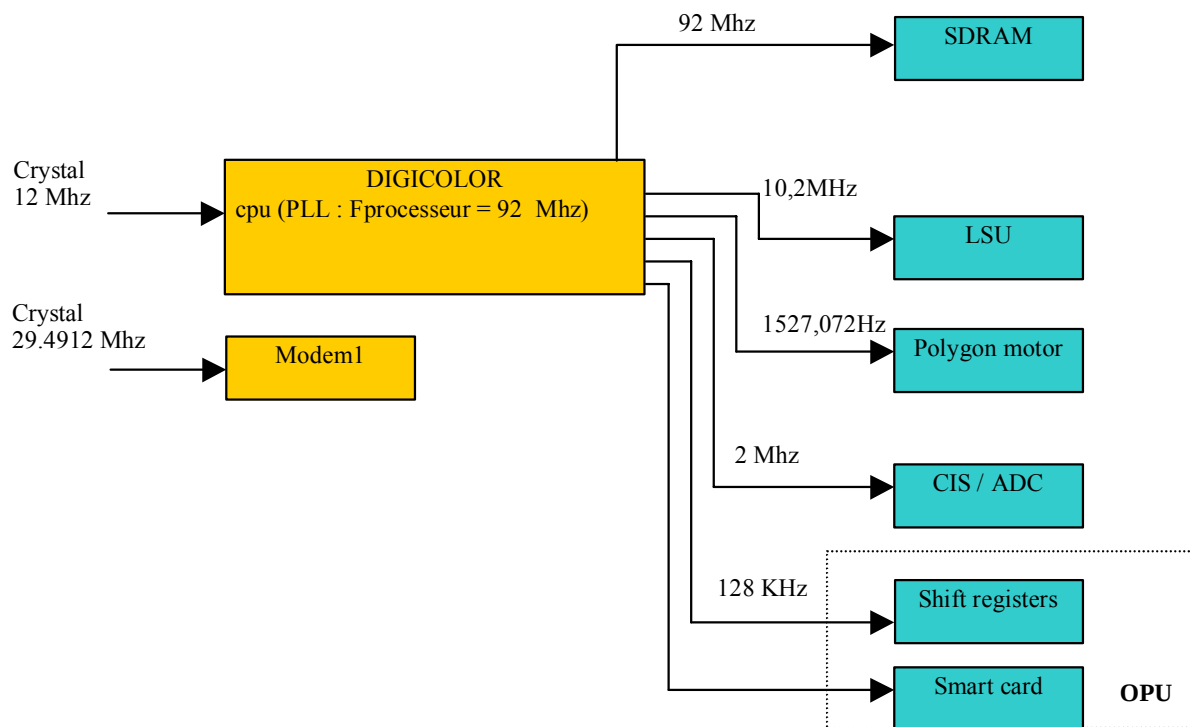
13.7 Clocks

Digicolor2:

One clock is supplied to digicolor2.

A crystal provides a 12MHz clock. The internal PLL from digicolor2 generates the 92MHz internal frequency.

Main board clocks:



13.8 Memories

Flash code memory

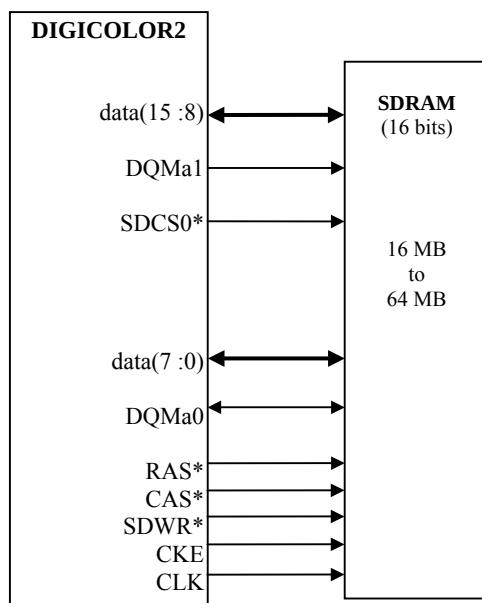
We can use flash code memory from 1 MByte to 8 Mbyte with an 8 bits data width. Flash code share the memory bus with SDRAM Memory.

There are two footprints for memory, but only one at a time.

- 1 TSOP48 footprint : memory size 1Mb to 8Mb (1Mb, 2Mb, 4Mb or 8Mb).
- 1 TSOP56 footprint : memory size 4Mb to 16Mb (4Mb, 8Mb or 16 Mb).

SDRAM

Digicolor2 manage one SDRAM chip 16MB to 64MB.



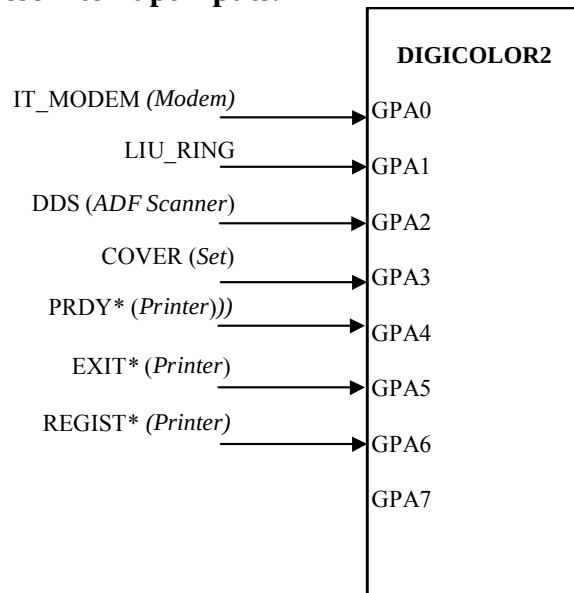
TSOP 54 footprint allow to use 64 Mbits, 128 Mbits, 256 Mbits ou 512 Mbits SDRAM :

- 64 Mbits, (1M x 16) 4 banks by chip (8 MB by chip)
- 128 Mbits, (2M x 16) 4 banks by chip (16 MB by chip, 12 RAS, 9 CAS)
- 256 Mbits, (4M x 16) 4 banks by chip (32 MB by chip, 13 RAS, 9 CAS)
- 512 Mbits, (8M x 16) 4 banks by chip (64 MB by chip, 13 RAS, 10 CAS)

13.9 Interrupt management

DIGICOLOR2 has 8 external inputs (port GPA0 to GPA7). These inputs can generate interrupts for internal ARM CPU. Active edge is programmable.

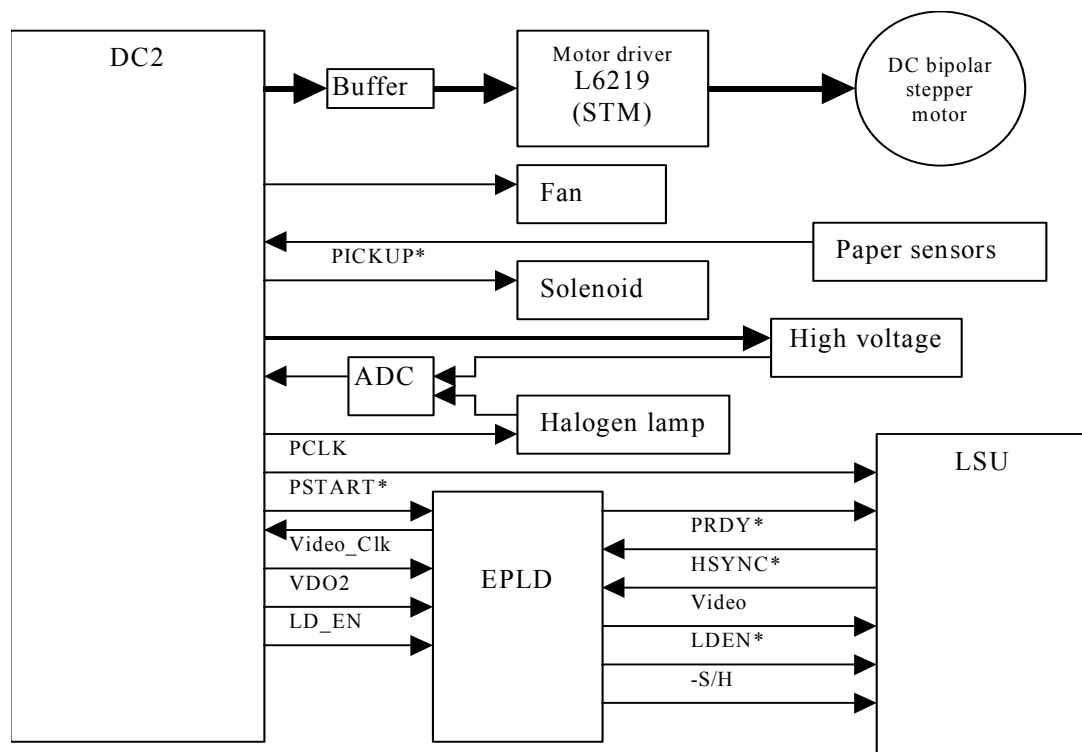
There is no priority on these interrupt inputs.



Only 7 inputs are used. The signal GPA7 is used as PWM output for the polygon motor control.

13.10 Printer interface

Block diagram



13.11 LSU

Description

The LSU includes the polygon motor, the laser diode, the sensor for line synchronisation and the lens to correct the beam distortion created by the polygon motor.

13.11.1 Connector to LSU(P351)

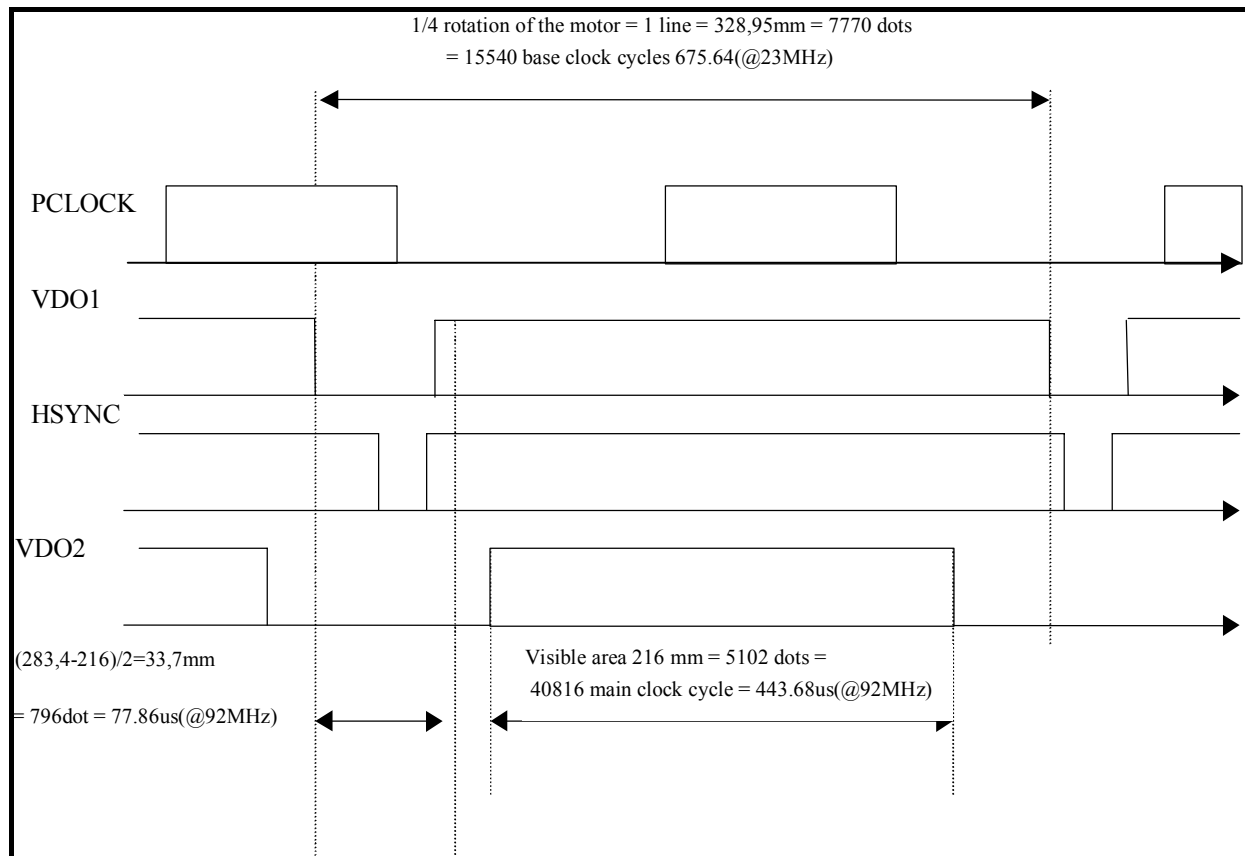
Name	Pin	I/O	Active	Current	Function
CLK	1	O		2mA	Clock for the motor
*READY	2	I	Low	2mA	Motor rotation detection (Low=synchronised)
*START	3	O	Low	2mA	Motor rotation (Low=Start ; High=Stop)
GND	4				Ground
+24V	5				Power supply
NC	6				Not connected
GND	7				Ground
Video*	8	O	Low		Video signal
LDEN*	9	O	Low		LED enable
-S/H*	10	O	Low		Enable LED power control
+5V	11				Power supply
GND	12				Ground
GND	13				Ground
*HSYNC	14	I	Low	2mA	Horizontal synchronisation

The motor is driven at 11295,32 rpm, and the clock frequency is 1129.532Hz.

The CLK clock is synchronised with the video clock. The frequency of the video clock is 10.22MHz.

HSYNC generation

In order to generate the horizontal synchronisation for the output pixel block, it is necessary to switch on the LED when the beam is in the area of the optical sensor.



The nominal main clock is set at 92Mhz. The base clock used by the Pixel Output section is set to Mainclock / 4 = 23MHz.

The parameter Ack_Assert in the register PO_COUNT_CONTROL is set to 1 which gives a video clock of 11,5MHz(Base Clock / 2).

A line is 328.95mm this means 7770 dots at 600dpi. As the video clock is 1/8 the main clock, the period of the PWMs for PCLK and VDO1 is $7770 \times 8 = 62160$ mainclock cycles or 15540 base clock cycle. If the main clock is set to 92MHz, it gives 675.65us per line.

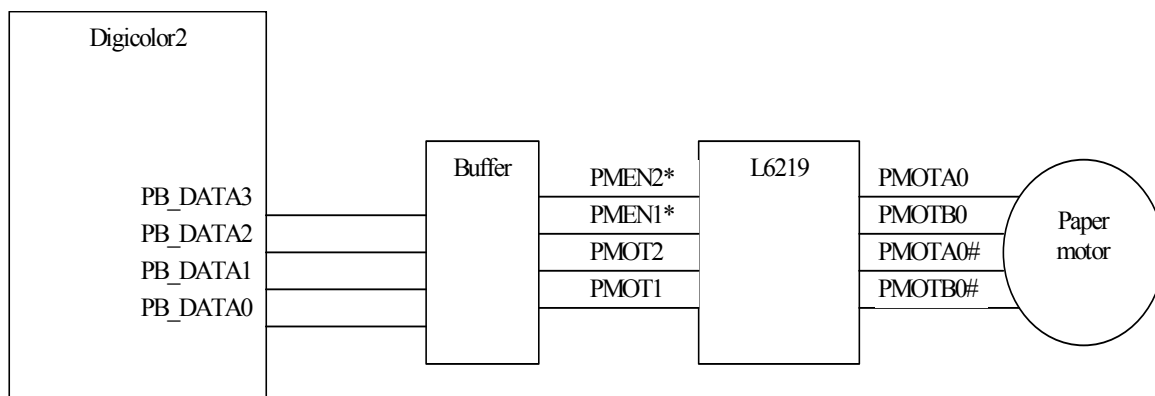
The motor period is $T_{\text{motor}} = 675.65 / 1.5 = 450,43\text{us}$ which gives 2220.11Hz. The motor needs 6 clock cycle for a complete round. The clock is an output of the PWM regulator.

13.12 Motor control

Connection

The digicolor2 drives one stepping motor for the printer module. This motor is controlled by current. The motor is controlled using the motor control block

The driver for the printer motor is the L9219 from STM (SO24 package) with 5V power supply. The motor is supplied from the 24V.



During the reset mode (power on) the signal AE1* is configured as input direction. A pull-up on the buffer input OE* forces the output of the buffer to high-impedance state. External pull-up I01, I11, I02, and I12 protects the motor.

After reset the motor buffer must be forced to the value 00h. The signal AE1* is controlled as output "0" to access motor and "1" for motor stand-by.

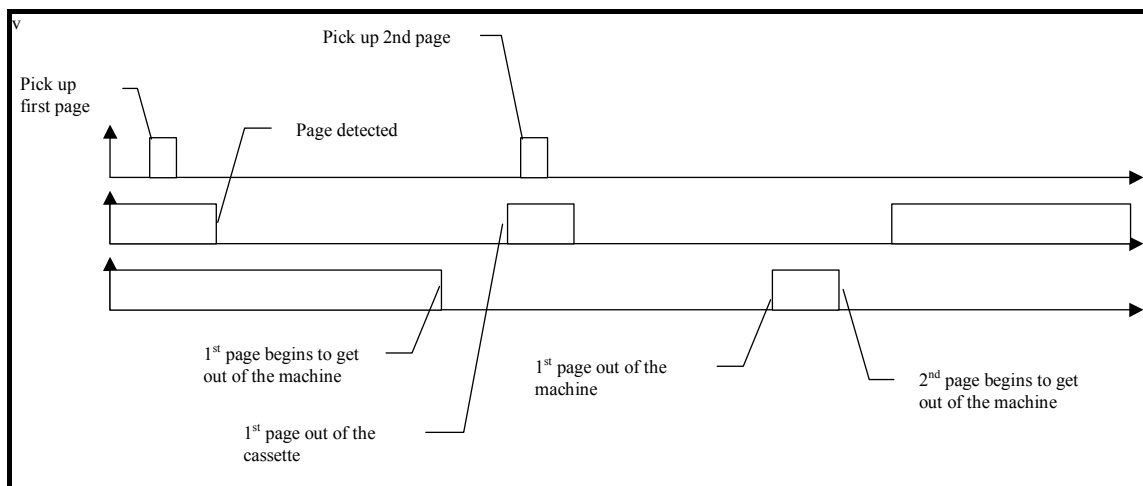
The maximum peak current is set using a voltage divider on the input Vref. The PWM frequency is set by the two RC filters R260, C253 and R261, C254. The current in each phase is sensed by two 1ohm resistor in parallel: R266, R267.

In this application, the maximum current is set to 600mA.

13.13 Sensor / Actuator

To control the printer engine, some sensors and actuators are necessary:

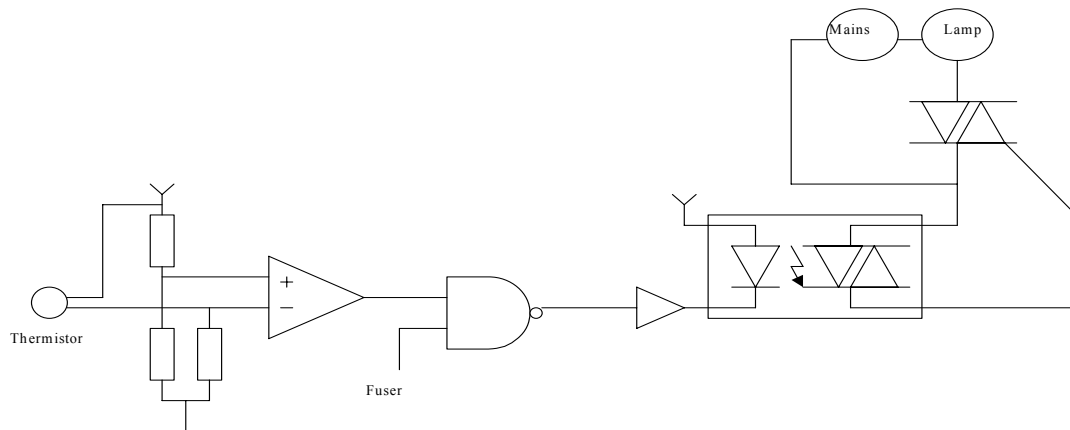
- COVER: this signal enables the CPU to monitor the status of the cover, if 0, the cover is open and the power supply of the SMPS and heater are cut, if 1, the cover is closed, the SMPS and fuser are normally supplied.
- nFAN and nFAN_HA enable the CPU to drive the fan at full or half speed. When both are inactive, the fan is switched off. The drawn current is 70mA at full speed and 35mA at half speed.
- PICKUP: Drive the solenoid to pickup paper. This signal is activated during 300ms to release the roller that picks up the paper. While activated, the current is 200mA and supplied by the 24V.
- PAPER* : Detects if there is some paper left in the cassette.
- REGIST* : Detects that the paper is correctly picked up from the cassette and enters the paper way.
- EXIT* : Detects that the paper is going out of the machine



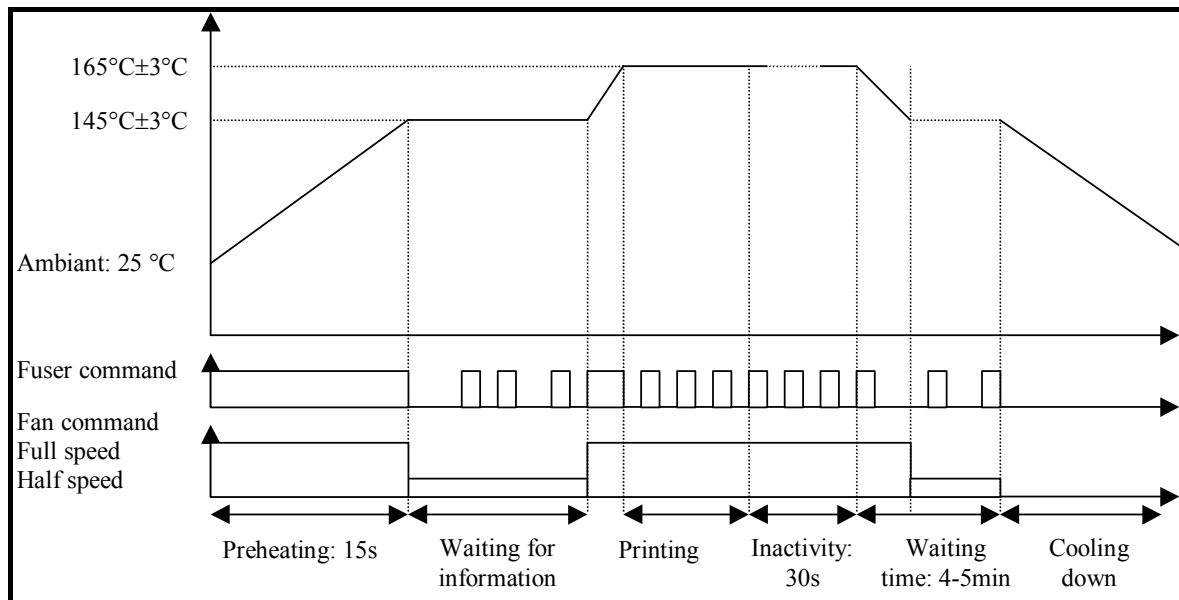
13.14 Heat control

A halogen lamp of 800W heats up the oven. The initial heating time is around 15s, it means that at full power, the temperature of the system change not faster than 8°C/s .

The FUSER signal switches on(1)/off(0) the halogen lamp. To protect the device against overheating, this signal is overridden by a thermal shutdown when necessary.



The output of the thermistor is measure through an ADC to enable an accurate regulation of the temperature. See following diagram for the normal behaviour.



13.15 Power supply interface

Transfer voltage management

RTRBEN*: Enables the transfer voltage generation.

TRREAD: This voltage is proportional to the current on the transfer voltage. The value is between 0 and 3.3V. The minimum voltage is reached when Transfer = -800V and the maximum when Transfer = -2200V.

TRPWM*: PWM signal used by the firmware to regulate the transfer voltage. The PWM frequency is 16kHz. The duty cycle is between 0% and 100%.

When RTRBEN* is ON(0) and TRPWM* is off(0%), the output voltage is reversed (Transfer=+800) to discharge completely the drum and clean it.

To protect Digicolor, the signal RTRBEN* and TRPWM* should be properly buffered.

Toner management

PRBEN*: Enables the high voltage output to charge the drum.

DBEN*: enables the high voltage output to precharge the toner.

To protect the output of the Digicolor, these two outputs should be properly buffered.

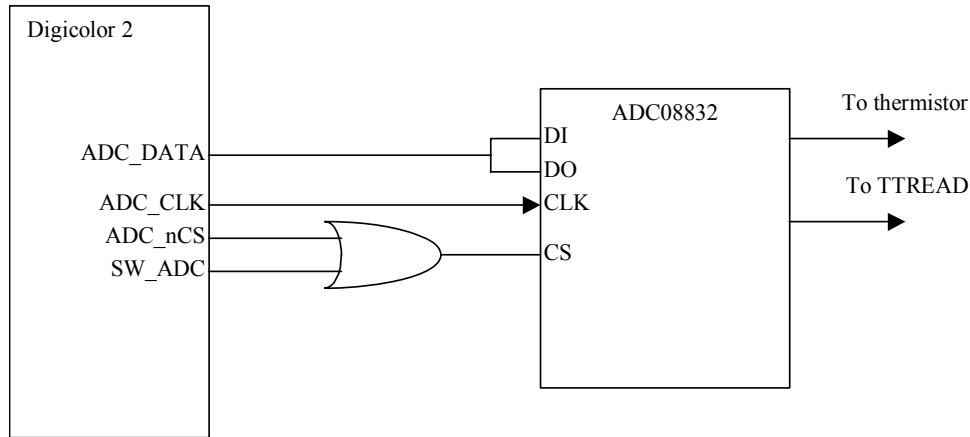
13.15.1 Connector to PGU(P350)

Pin	Signal	Pin	Signal
1	+24V after switch	2	+24V after switch
3	PRBEN*	4	TRREAD
5	TRPWM	6	RTRBEN*
7	DEBEN*	8	PAPER*
9	REGIST*	10	PICKUP*
11	+24V	12	+24V
13	GND	14	GND
15	GND	16	GND
17	+5V	18	+5V
19	+5V	20	+5V
21	-12V	22	HEAT
23	FAN*	24	PMOTB0*
25	PMOTA0	26	PMOTA0*
27	PMOTB0	28	SMOTB0*
29	SMOTB0	30	SMOTA0*
31	EXIT*	32	SMOTA0

13.16 ADC for temperature and high voltage control

Block diagram

The ADC08832 enables the Digicolor to measure the temperature of the drum and the transfer voltage.



The signals DI and DO are tied together to use only one pin for programming and reading the ADC.

The clock frequency is set to 2MHz, which is done setting the register EA_CLOCK_DIVIDE to 45. In this case the conversion time will be 6,5us.

The signal CS_ADC is used to properly multiplex the smart card interface with the ADC interface. When the ADC interface is active, the signal CS_ADC is set to 0. When the smart card interface is active, the signal is set to 1.

13.17 EPLD

Hsync generation

This block is composed of two parts. The first one is a 14bits-shift register and the second one a 14bits decounter.

The 14bits-shift register is loaded using the signal data in (DI), clock (CLK) and chip select (CS).

The 14bits decounter is loaded with the value stored in the shift register on the falling edge of HSYNC. On the rising edge of HSYNC, the counter starts decounting. When it reaches 0, the output(VDO1) is set to 1. When decounting the output is set to 0. After reset the output is set to 1.

To enable printing, the firmware should load the shift register with the proper value and then set LDEN. The laser will then be switched on permanently until the decounter gets the first falling edge on HSYNC. After the first line, the counter is automatically reloaded and restarted at each end of line.

13.18 Smartcard and ADC mutiplexing

The EPLD filters all signals coming from the Digicolor during ADC operations and disable the ADC during smartcard operations.

13.19 Fuser interface

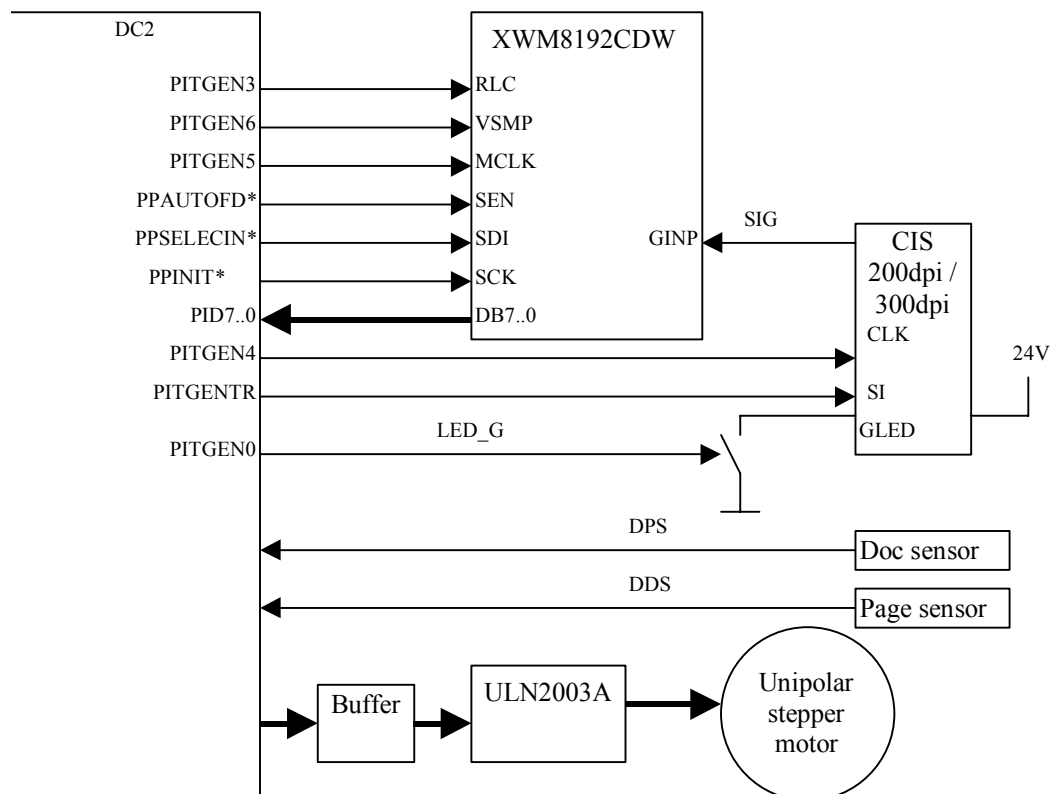
The fuser interface is protected against excessive temperature.

- HEATER = FUSER nor THERM_IN

FUSER is set to 1 by the firmware to switch on the heater. When the temperature raises above the maximum limit, THERM_IN is set to 0 by the hardware.

13.20 Scanner interface

Block diagram



13.21 CIS control

13.21.1 Connector to CIS (P300)

Pin	Signal
1	AO
2	GND
3	VDD(+5 V)
4	SI
5	CLK
6	GLED
7	VLED

The CIS is controlled using 2 signals:

- CLK: Pixel clock. The maximum frequency is 2MHz.
- SI: Start pulse to begin a new scanning line. This signal is active high and should last one clock cycle. The data on SIG are available **xxxclock** cycles after SI.

13.22 LED management

The signal VLED of the CIS is connected to the 24V. The signal GLED is switched on and off by a port of a ULN2003 (Z202). Three resistor in parallel limits the current to the requested value.

For the 200DPI CIS, the characteristics are:

- 92mA
- Forward voltage of the LED: 13.5V-15V (for 35mA)

set to 92mA for 200DPI CIS. The source is switched on/off by the signal LED_G. The minimum forward voltage is 17,4V, the maximum **18,9V**, so the source current should withstand a Vce between **xxxV** and **xxxV**, and a maximum power of **1W**.

13.23 AFE

The analogue front end is a XWM8192 from Wolfson. This is a 16bits, 6MPS ADC. The red channel is used to digitalis the output of the CIS. The analogue signal is amplified by the transistor Q320. This amplifier can be short cut by the resistor R312.

The Digicolor controls the ADC through a serial link and gets the data through a pixel bus (PI_DATA7..0). See §10.6.1

The reference voltages are filtered by 100nF in parallel with a 22uF to minimise the ripple.

13.24 Motor control

The motor for the ADF scanner is a PM35S-048-ZKS5 from Minebea Electronics unipolar stepper motor. The motor is driven from the Digicolor using a buffer and a ULN2003A.

During the reset mode (power on) the signal AE1* is configured as input direction. A pull-up on the buffer input OE* forces the output of the buffer to high-impedance state. The internal pull down of the ULN2003 prevent the motor to be improperly driven.

After reset the motor buffer must be forced to the value 00h. The signal AE1* is controlled as output "0" to access motor and "1" for motor stand-by.

The driver is protected against overvoltage by a xxxV zener diode connected to the COM pin.

13.25 SENSOR

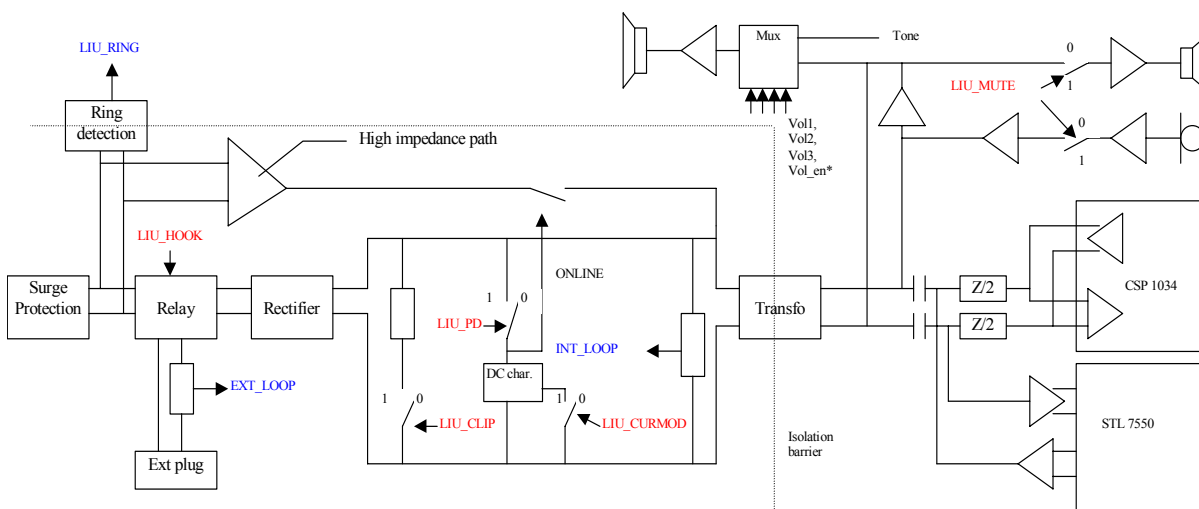
The two sensors LTH-301A from xxxx are located on the OPU.

DDS: Document detection sensor, is **1** when a document is introduced in the ADF, **0** when the ADF is empty.

DPS: Document position sensor. This signal is **1** when there is no paper in the feeder and 0 otherwise. This sensor is used to detect a change of page while scanning a document.

13.26 MODEM & line interface

Block diagram LIU



13.26.1 Description

General

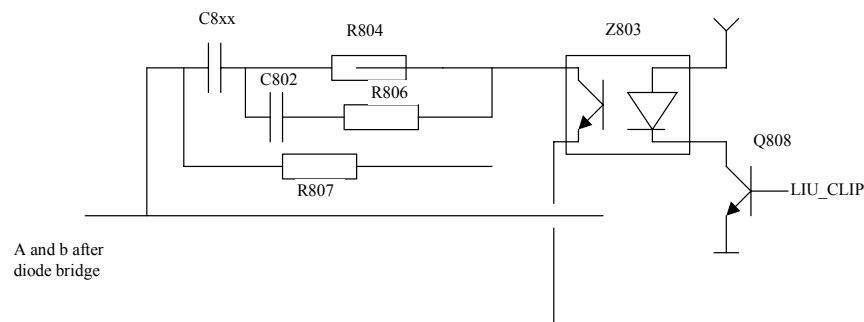
The direct interface to the line should be insulated from the rest of the PCB for safety reasons. This means that at least a free area of 3mm should be present on the layout between the hot side and the rest of the PCB. All control signals use optocouplers with an insulation of 3000V minimum. The AC signal is coupled to the line via a transformer with sufficient insulation.

13.26.2 Protection

The protection block protects the circuit against surges on the lines up to +8kV in common mode and provides some filtering for EMC. This block should not have any effect on sinusoidal signals up to 120Vrms with an offset of 60Vdc.

13.26.3 Clip impedance

The clip impedance is presented on the line on request by the signal LIU_CLIP. It is composed of one DC impedance of 100kOhms and one AC impedance connected between a and b.

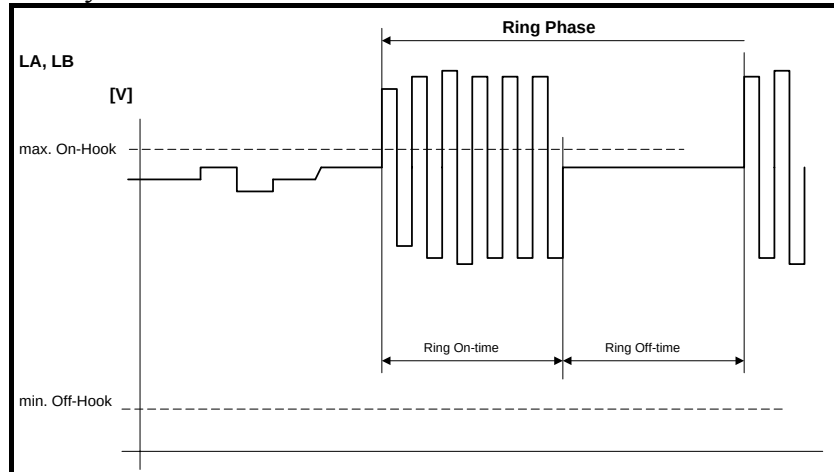


During On-Hook configuration some Calling Line information may be received by using CLID handling. To enhance the reception of this CLID information the line characteristic has to be adapted by activating a specific CLID control signal (**LIU_CLIP**).

13.26.4 Line sensing

Incoming Ring (On-Hook)

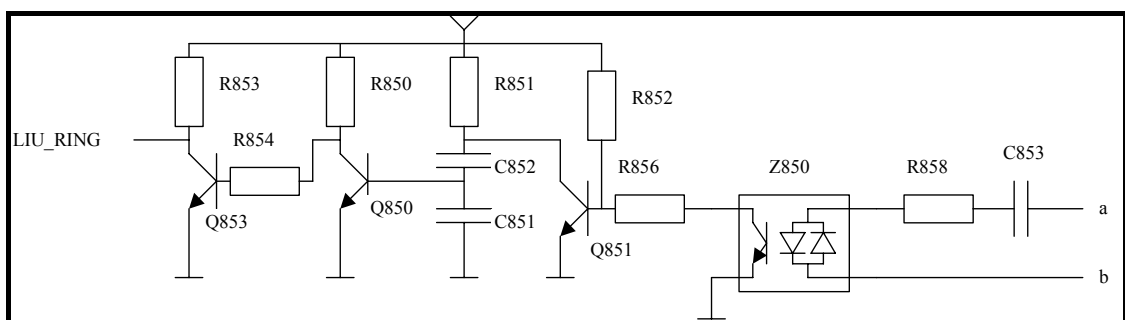
To signal the Terminal Equipment, whether an incoming call is pending, a **ring signal** is generated at the line by the network.



The ring signal is specified by its amplitude, its frequency and the cadence (On- and Off-time relationship). The ring signal transmission is terminated when a valid loop current is detected by the network. The ring amplitude is added to the line On-Hook voltage.

LIU_RING:

Digital Input Ringer/Polarity Reversal input signal. This signal is used to detect ringer signals (frequency, cadence) and polarity reversals on the line.



The output signal is properly provided for a ringing signal between 18Vrms and 100Vrms with a frequency between 13Hz and 50Hz and a DC offset between -60V and +60V.

The capacitor C853 acts as high pass filter to cut off any DC current during on hook. The optocoupler Z850 provides a full-rectified signal for detecting polarity reversal and ringing signal. For each edge the flip-flop Q851 / Q850 provides a pulse. The duration of the pulse is set with resistor R851 and capacitor C851, C852. The transistor Q853 inverts the signal.

A rectangular signal with constant pulse width (**5 ms**) is provided when a ring is applied. A single pulse is provided if the line has been reversed. The ring signal frequency is twice (x 2) the applied ringer frequency.

Ring signal status (RING) changes if PD changes, a line break occurred or an external or parallel phone has taken the line !

<i>RING</i>	<i>State</i>
0	Default , no line transition occurred
1	Ring or Polarity Reversal

13.26.5 Line control

EXT_LOOP:

Loop current input signal. This signal is used to indicate that a loop current is drawn by an external phone (if Off-Hook). External loop current status (EXT_LOOP) also changes if Ringer applied Parallel Phone state changes

<i>EXT_LOOP</i>	<i>State</i>
0	Loop current, external Phone Off-Hook
1	Default , no loop current

The loop detection detects the current that flows in the external parallel phone. The detection should bi-directional and work from 5mA to 100mA without disturbing the external phone.

INT_LOOP:

Internal loop detected. This signal is used to check the voltage in the LIU.

<i>INT_LOOP</i>	<i>State</i>
0	Default , Off Hook or line disconnected (LIU_HOOK=0)
1	Line connected(LIU_HOOK=1) and On Hook

The voltage is measured just after the rectifier bridge. The threshold level can be adjusted by R817 and R818. The transistor Q805 then drives the optocoupler Z801.

External loop current status (EXT_LOOP) also changes if

PD changes
Ringer applied
Parallel Phone state changes
Line polarity reversal
Flash key dialled

The two signals EXT_LOOP and INT_LOOP are then used by the firmware to decide whether or not switch the relay.

LIU_HOOK:

External phone Connection, controls output the relay. This signal is used to establish a line connection (**LA2,LB2**) between the FAX system (Terminal Equipment, TE)and the Ext. phone

Loop current status (LOOP) changes if HOOK changes!

HOOK	State
0	On-Hook (External phone connected)
1	Off-Hook (External phone disconnected)

Line State	HOO K	PD
On-Hook	0	0
Off-Hook	1	1
Off-Hook (dialling)	1	1,0

When not powered, the relay should connect the external phone to the line. At start-up the firmware activates the relay to connect the LIU.

PD: Pulse Dial

This signal is used to generate line (loop current) connections and disconnection. If inactive (Low) no connection between the line and the terminal equipment exists.

Loop current status (LOOP) changes if PD changes!

PD	State
1	Make (Line connected)
0	Break (Line disconnected)

LIU_CURMOD:

Current Modulation. The signal is used during Pulse Dial only to enhance the switching characteristics of **PD** (Loop Current). Keep activated during dialing of a complete digit. Not activated if flash is dialed.

CURMOD	State
0	Default , no current
1	Loop current enforced

LIU_CLIP:

Clip Impedance Setting Control output signal. The signal is used to select additional line impedance during CLI handling. This signal should be activated only during V23 or DTMF reception.

CDI MP	State
1	CLI Line Impedance on
0	Default , Normal Line Impedance

13.26.6 Gyrator (DC characteristics)

The DC characteristic must be easily customised to fit the needs of TBR21, Eastern Europe (600ohms), Australia and USA. If possible, two impedance's should be mounted at the same time and switched by firmware depending on country setting.

The main characteristic is given by the two transistors Q802 and Q803. The transistor Q804 limits the current rushing through Q802 and Q803. The threshold level for the limitation can be set with R810, R811 and R808.

13.26.7 High impedance path

The high impedance path enables the codec to listen to the line during on-hook state: clip reception, CNG detection. The signal is taken between a and b, just after the protection circuitry. The amplifier Z852 amplifies the signal. The high impedance path is muted during off-hook by the transistor Qxxx. To switch on/off this path, the voltage is measured in parallel with the DC characteristics. The threshold level is given by R878 and R876.

13.26.8 Signal flow

Line handling

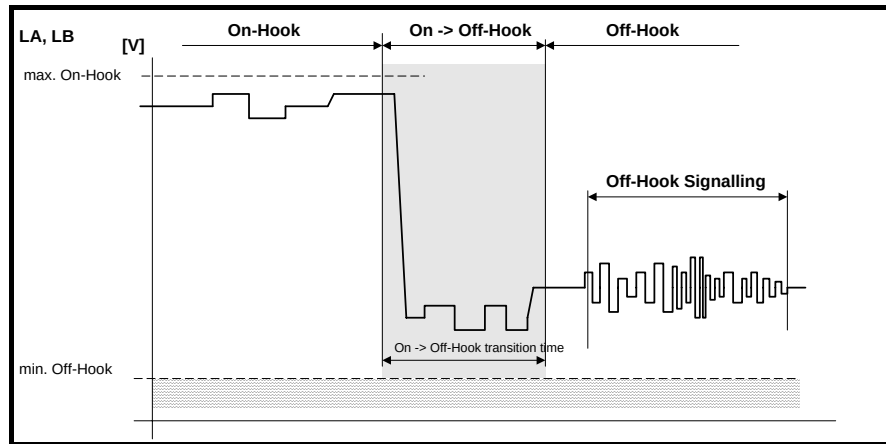
The **Line Signals** are used to transfer information depending on the state of the voltage and current rating. Each signal is influenced according the current information transfer.

LA, LB,

LA1, LB2

On-Hook, Off-Hook Configuration

The activation of the **hook-switch (HOOK)** in the line connection, of the **Line Control** component, establishes a connection between the network and the terminal equipment (**LIU**).



Due to the change of the source resistance of the terminal equipment the line voltage drops from an idle state (On-Hook) to a connection state (Off-Hook).

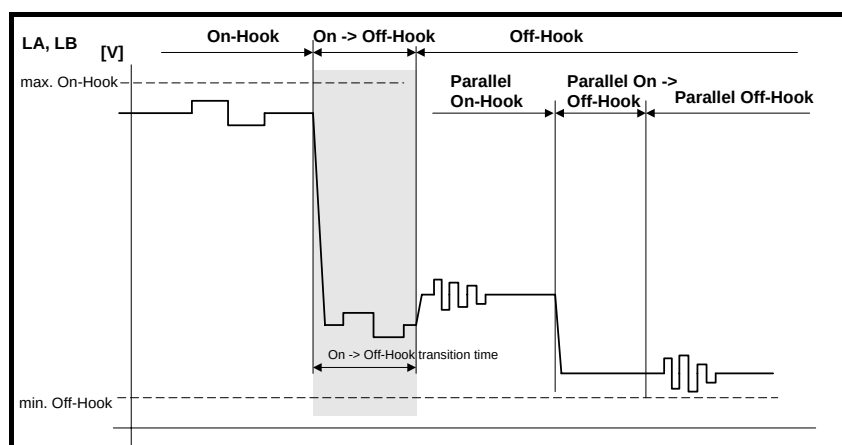
Drops at the line voltage (connection) are not necessary a On- to Off-Hook transition. A rising loop current in conjunction with a voltage drop at the line is indicating a valid connection.

Parallel Terminal Equipment Off-Hook (On-Hook)

The activation of a parallel Terminal equipment, during normal terminal equipment On-Hook (HOOK=0), establishes a connection between the network and the parallel terminal equipment only. Due to the source resistance change of the parallel terminal equipment the voltage drops from an idle state (On-Hook) to a connection state (Off-Hook).

Parallel Terminal Equipment Off-Hook (Off-Hook)

The activation of parallel Terminal equipment, while terminal equipment Off-Hook, establishes not a new connection between the network and the parallel terminal equipment but due to the additional, parallel source resistance a additional drop of the line voltage and the loop current will occur



External Phone Detection

The external phone is not connected to the line as long as a Off-Hook Line configuration is executed, which connects the terminal equipment instead of the external phone.

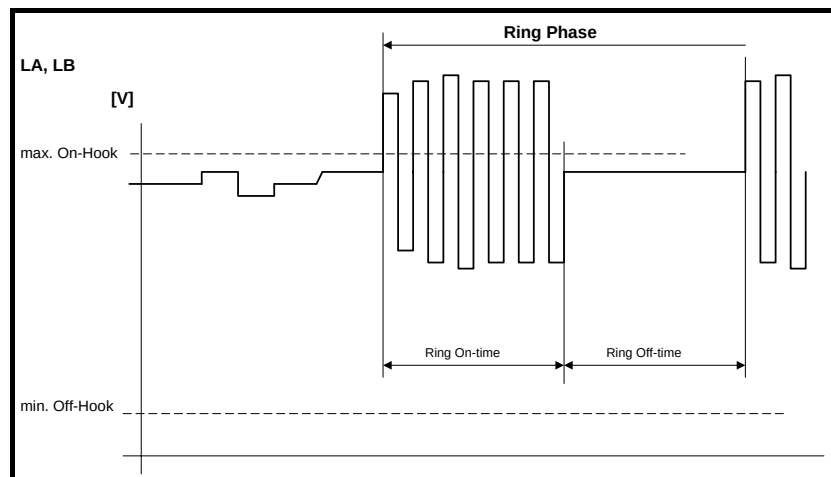
If the terminal equipment was On-Hook the behaviour is the same as described with *Off-Hook, On-Hook Configuration*. If Off-Hook, the external phone is connected prior disconnecting the terminal equipment. During the transition phase a short drop of the loop current can occur.

Pulse-Dial (Off-Hook)

To signal the network to establish a connection between the terminal equipment and another line equipment, a number of impulses is used to transfer a 'phone number' (a defined number of digits) of the other line equipment to the network. The digits that are used to specify a phone number are coded by the number of line disconnection's and reconnections. These voltage and current changes are mirrored at the line signals.

Incoming Ring (On-Hook)

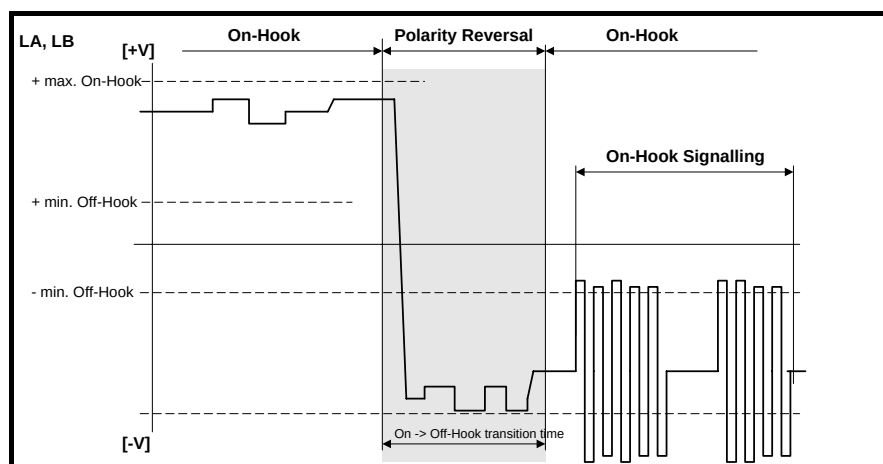
To signal the Terminal Equipment, whether an incoming call is pending, a ring signal is generated at the line by the network.



The ring signal is specified by its amplitude, its frequency and the cadence (On- and Off-time relationship). The ring signal transmission is terminated when a valid loop current is detected by the network. The ring amplitude is added to the line On-Hook voltage.

CLI Polarity Reversal (On-Hook)

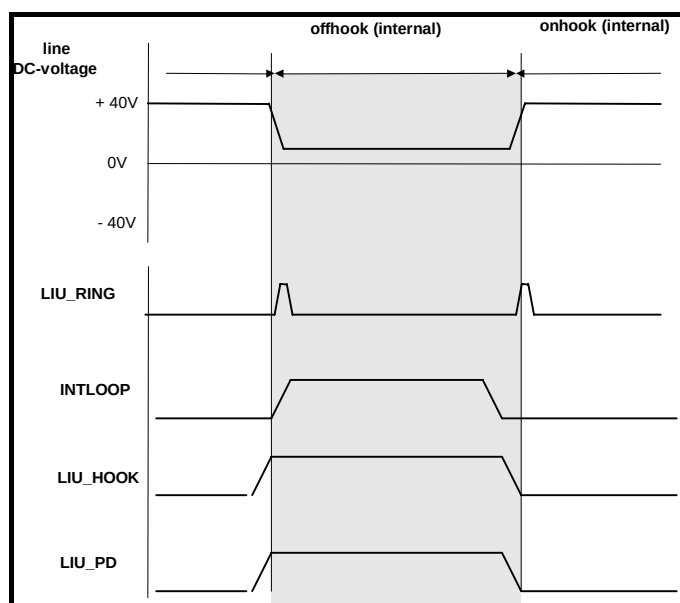
The signaling of some network services (e.g. CLI) is indicated by a reversal of the line voltage, which means the polarity of the voltage between the line connection LA, LB changes.



13.26.9 INTLOOP signal

Loop Current Detection

The activation of a On-Hook or Off-Hook Configuration, a parallel Terminal equipment On- or Off-Hook change, an External Terminal equipment On- or Off-Hook change and Pulse Dial activity change the loop current accordingly. This signal can change only if the LIU is connected to the line (LIU_HOOK=1).

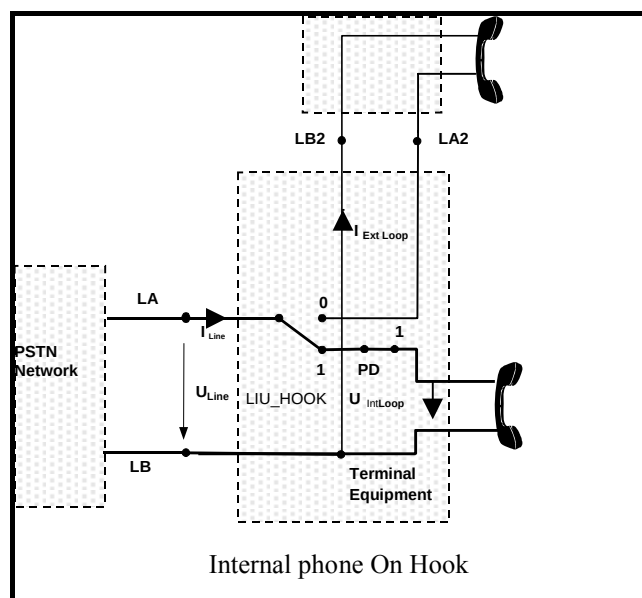


Loop Detection Table

<i>LIU state</i>	<i>LIU_HOOK</i>	<i>PD</i>	<i>INTLOOP</i>	<i>EXTLOOP</i>	<i>LOOP Current</i>	<i>External Phone</i>
Onhook / Loop	0	0	0	1	NO LOOP	EXT. PHONE
Onhook / No Loop	0	0	0	0	NO LOOP	NO EXT. PHONE
Offhook / Handset lifted	1	1	1	0	LOOP DET.	INTERNAL
Offhook / Pulse Dial	1	X	X	0	LOOP DET.	INTERNAL
Offhook / DTMF Dial	1	1	1	0	LOOP DET.	INTERNAL
Offhook / FAX	1	1	1	0	LOOP DET.	INTERNAL
Offhook / No Loop	1	1	0	0	NO LOOP	INTERNAL

Off-Hook, On-Hook Configuration

The activation of the hook-switch (HOOK = 1 and PD=1) within the line connection, establishes a connection between the network and the terminal equipment. Due to the reduction of the source resistance of the terminal equipment, the loop current (I_{loop}) rises which indicates an Off-hook condition. The loop current is above a certain threshold as long as the terminal is connected (by detecting a valid loop current within the terminal equipment) or the network is in a valid loop current state (see also *LA, LB On-Hook, Off-Hook Configuration*). Due to a hook change, the changing line voltage may introduce an erroneous ring (RING) signal !

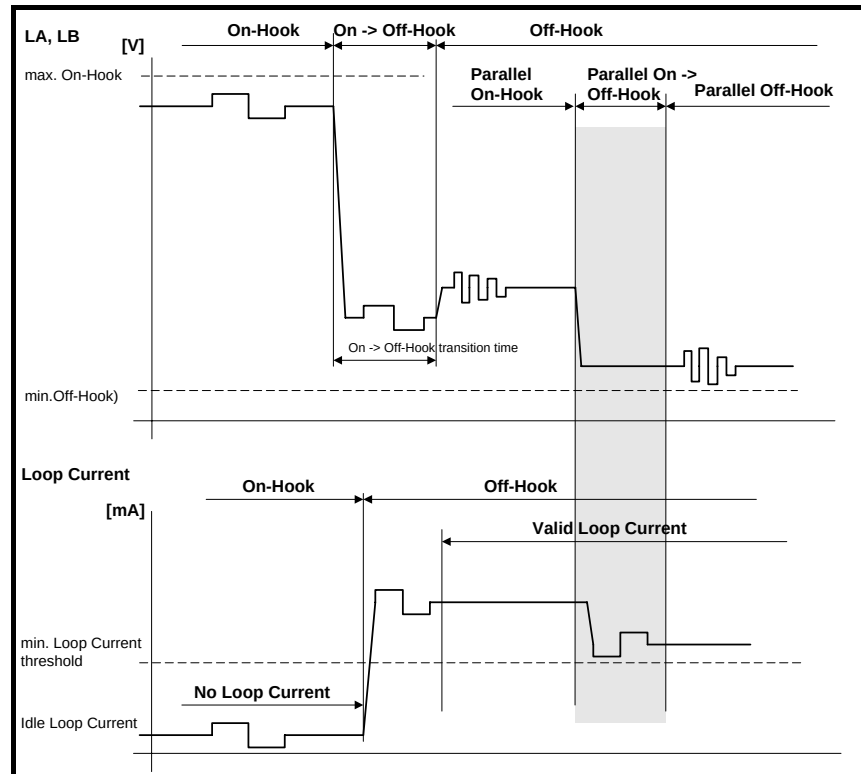


Parallel Terminal Equipment Off-Hook (FCU Off-Hook)

When a parallel terminal equipment, connected directly to the line, goes Off-Hook, it reduces the line voltage, which results in a drop of the loop current that may be detected.

Parallel Terminal Equipment Off-Hook (FCU On-Hook)

The loop current change due to an parallel off-hook condition has only little effect for the idle loop current (On-Hook state).



Incoming Ring (On-Hook)

The line voltage change due to an incoming ring has no effect on the loop current detection if LIU_HOOK=0 and may have an effect if LIU_HOOK=1. See also EXTLOOP signalling.

CLI Polarity Reversal Detection (On-Hook)

The line voltage changes the polarity as well as the idle loop current, but has no effect if LIU_HOOK=0 and may have an effect if LIU_HOOK=1..

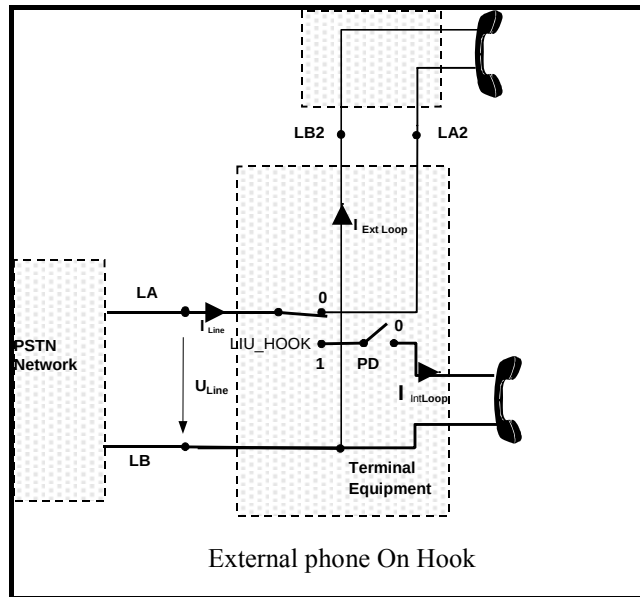
Pulse-Dial

The signalling during Pulse-Dial has been described in detail with PD Pulse-Dial. The current changes during Pulse-Dial are mirrored by INTLOOP.

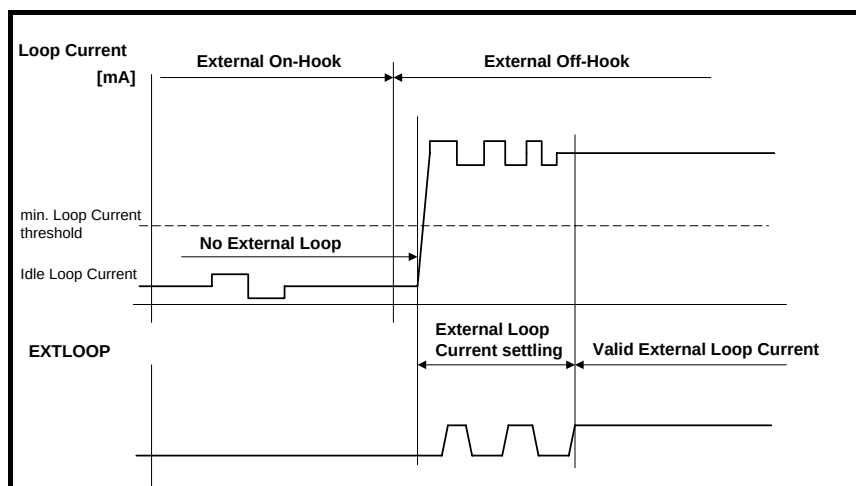
13.26.10 EXTLOOP signal

During FCU Off-Hook, the terminal equipment is connected to the line, and the external phone completely disconnected, so no external phone detection is possible!

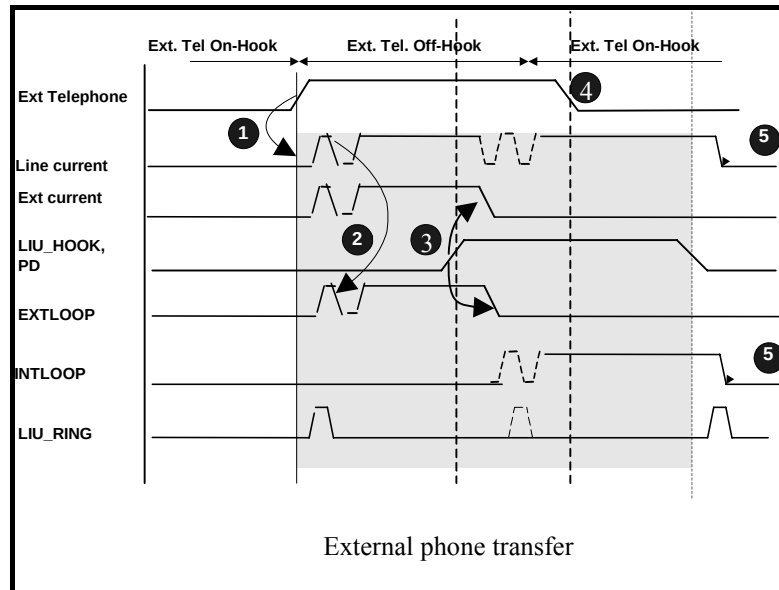
During terminal equipment On-Hook (HOOK = 0, PD = 0), the external terminal equipment is connected to the line by LA2, LB2. If the external terminal equipment goes Off-Hook (eg. by lifting the Handset) it draws a loop current from the network (I_{Ext_Loop}). This current change is sensed by the Loop Detection Component and a status (EXTLOOP) signal is activated as long as the external equipment is Off-Hook and the internal is disconnected



If the external terminal equipment is connected with the line (HOOK = 0, PD = 0) (going Off-Hook), a valid loop current has to be drawn to established a valid connection.

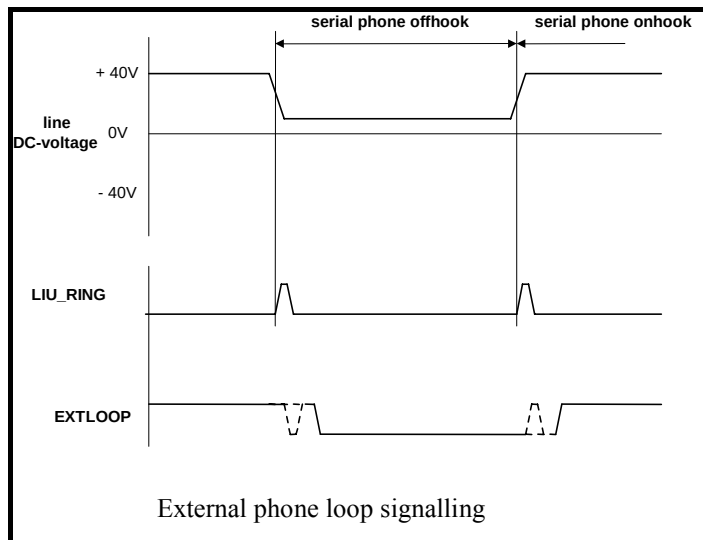


After an external phone has seized the PSTN line (1) some loop current is drawn (2) and the external loop detection signal (EXTLOOP = 0) is activated. If the FCU LIU is then connected (Off-Hook) to the line (3) (LIU_HOOK = 1, PD=1), the external loop current is removed (EXTLOOP=0) while the internal loop current is drawn by the LIU(INTLOOP=1). The switching from the external to the internal equipment may introduce a short loop loss. If the external phone is now dropped, no loop current change occurs(4). At the release of the internal loop current, due to going On-Hook (HOOK = 0, PD=0), the loop current is removed (5) followed by deactivating the loop current signal (INTLOOP = 1)



External (Phone) Loop Detection

External Loop Detection is valid during On-Hook only. If internal On-Hook (LIU_HOOK = 0) and an external phone is Off-Hook, a loop current is drawn and the loop detection signal is activated (EXTLOOP = 0). The external loop current is equivalent to the loop current. Due to other LIU activities (Incoming Ring, Pulse Dial etc.) the loop detection signal (EXTLOOP) may change erroneously !



External Phone Detection Table

LIU state	LIU_HOOK	PD	EXT_LOOP	Loop Current	Ext. Phone
Onhook / No External Phone	0	0	0	NO LOOP DET.	NO EXT. PHONE
Onhook / External Phone	0	0	1	NO LOOP DET.	EXT. PHONE
Offhook / External Phone	1	0	0	LOOP DET.	No Change
Offhook / No External Phone	1	0	0	LOOP DET.	No Change

Incoming Ring

The line voltage change due to an Incoming Ring may have an effect for the external loop current (EXTLOOP). During an incoming ring, while On-Hook, the ringer signal (see RING Signal Description) may be mirrored by the EXTLOOP signal !

Pulse-Dial (External Phone)

The line voltage and current change during external phone Pulse Dial has an effect for the external loop current (EXTLOOP) as long as the internal phone (LIU_HOOK = 0) stays On-Hook. The pulse dialing signals are mirrored by the EXTLOOP signal !

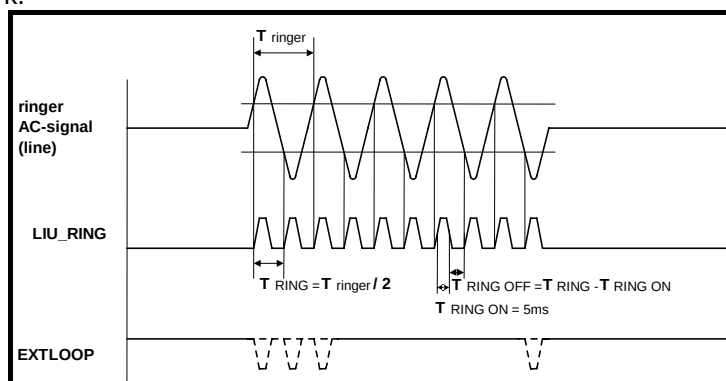
Parallel Terminal Equipment Off-Hook (On-Hook)

The line voltage change due to parallel Off-Hook has some effect on the internal loop detection (EXTLOOP). If the parallel phone is Off-Hook in addition the loop current signal may be lost (change) erroneously !

12.26.11 RING

Incoming Ring

To signal the terminal equipment an incoming call during On-Hook, a defined AC signal is applied by the PSTN network.



The level and the frequency as well as the on- off ratio (cadence) of the signal is within certain limits Any change of the line voltage is detected by the ring detector which generates a pulse of a defined duration. A changing line signal is mirrored by the ring detection signal (RING) with twice the line signal frequency : $f_{\text{ringer}} = f_{\text{RING}} / 2$. . An Incoming Ring on the line may be mirrored by the loop detection signal. (INTLOOP) if LIU_HOOK=1.

On-Hook , Off-Hook Line Configuration

During terminal equipment On-Hook the line control signal is set inactive (HOOK = 0) to inhibit a valid loop current. Due to the line voltage change, a change of the ring signal within the ring detection HW-component may occur. If settled, only an idle loop current (On-Hook) is drawn from the network.

Pulse-Dial (External Phone)

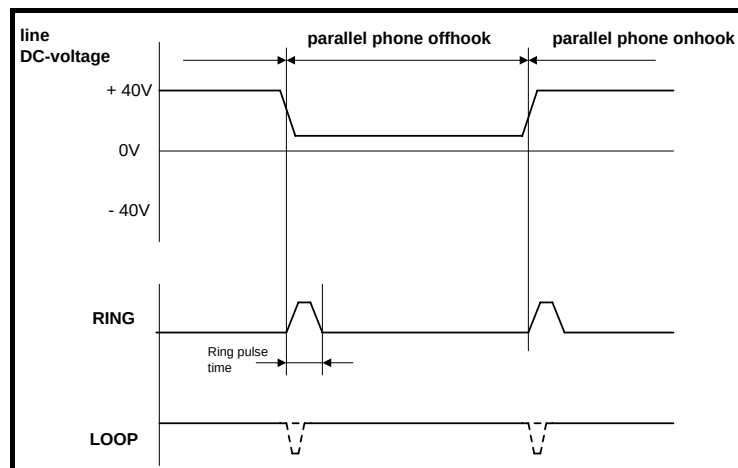
The line voltage and current change during external phone Pulse Dial has an effect for the ring detection signal (RING) as long as the internal phone (HOOK = 0) stays On-Hook. The pulse dialling signals may generate some ring detection pulses !

Parallel Terminal Equipment Off-Hook (FCU On-Hook)

The loop current change due to an parallel off-hook condition has some effect for the idle loop current (On-Hook state). A change of the line voltage may result in a short invalid change of the ring signal !

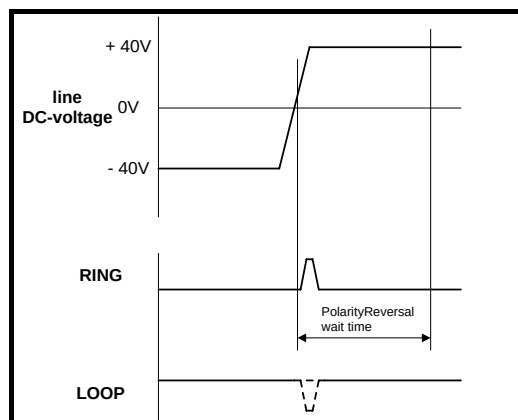
Parallel Terminal Equipment Off-Hook (FCU Off-Hook)

Due to the possibility of connecting a parallel terminal equipment which, when also internal Off-Hook, reduces the line voltage which may result only in a reduction of the loop current. This line voltage change may also introduce an invalid ring detection pulse !



CLI Polarity Reversal, CLI Services

Any line voltage polarity change is used to generate a single ring detection pulse during either LIU On- or Off-Hook. To indicate a valid polarity reversal detection no other pulse is to be allowed within a defined duration !



On-Hook , Off-Hook Line Configuration

During terminal equipment On-Hook the line control signal is set inactive (HOOK = 0) to inhibit a valid loop current. Due to the line voltage change, a change of the ring signal within the ring detection HW-component may occur, generating an invalid polarity reversal pulse !

Pulse-Dial (External Phone)

The line voltage and current change during external phone Pulse Dial has an effect for the polarity reversal signal (LIU_RING) as long as HOOK is kept deactivated (On-Hook). The pulse dialling signals may generate an invalid polarity reversal detection pulse !

If a parallel phone has seized the line changing of the line voltage, due to the dialled digits, may also generate an invalid polarity reversal detection pulse !

Parallel Terminal Equipment Off-Hook (FCU On-Hook)

The line voltage change due to an parallel off-hook condition has some effect on polarity reversal detection (On-Hook state). A change of the line voltage may result in a short pulse of the ring signal and a invalid polarity reversal detection !

Parallel Terminal Equipment Off-Hook (FCU Off-Hook)

Due to the possibility of connecting a parallel terminal equipment which, when also internal Off-Hook, reduces the line voltage which may result also in a reduction of the loop current. This line voltage change may also introduce an polarity reversal detection pulse !

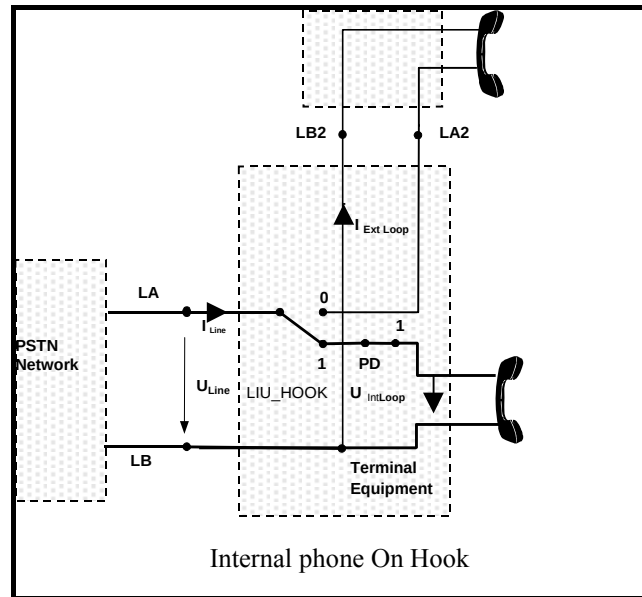
13.26.12 LIU_HOOK

On-Hook Line Configuration

During terminal equipment On-Hook the line control signal stays inactive to inhibit a valid loop current. Only an idle loop current (On-Hook, external On-Hook) is drawn from the network. The dial control signal should be kept activated (PD = 0).

Off-Hook Line Configuration

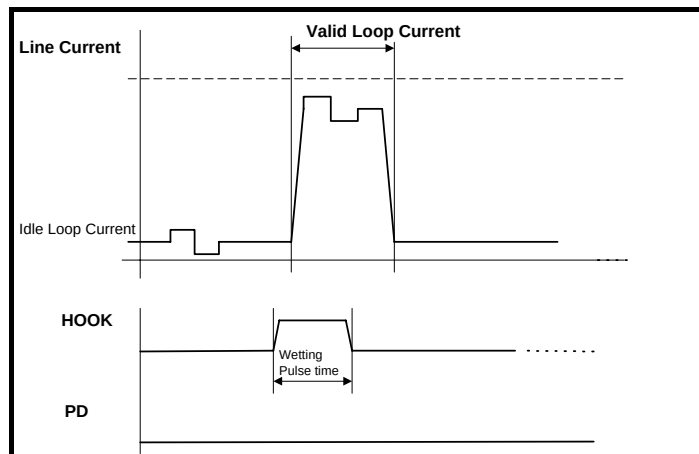
The activation of the Hook-signal (HOOK = 1) establishes a connection between the terminal equipment and the network. To draw a valid loop current the dial control signal (Hook/Pulse Dial control signal, PD) has to be activated (PD = 0) in addition.



CLI Services

To signal a CLI service transmission start, during CLI service handling, the terminal equipment has to draw a current pulse from the network (Wetting Pulse) by activating the HOOK signal.

To signal a valid preparation for CLI reception, a short loop current pulse is drawn from the network. This is handled by activating the line connection switch (HOOK) for a defined duration.



13.26.13 PD

On-Hook Line Configuration

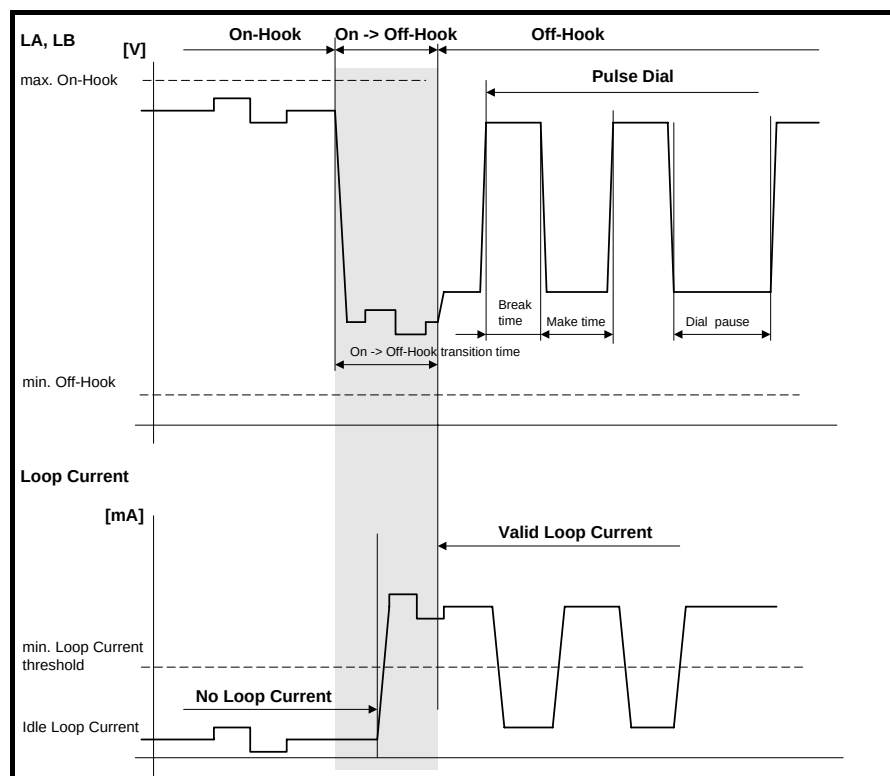
During terminal equipment On-Hook the PD control signal stays inactive to inhibit a valid loop current. Only an idle loop current (On-Hook) is drawn from the network

Off-Hook Line Configuration

The activation of the dial control signal (PD) in addition with the line control signal (HOOK) establishes a connection between the terminal equipment and the network. To draw a valid loop current the PD signal (Hook/Pulse Dial control signal) has to be kept activated.

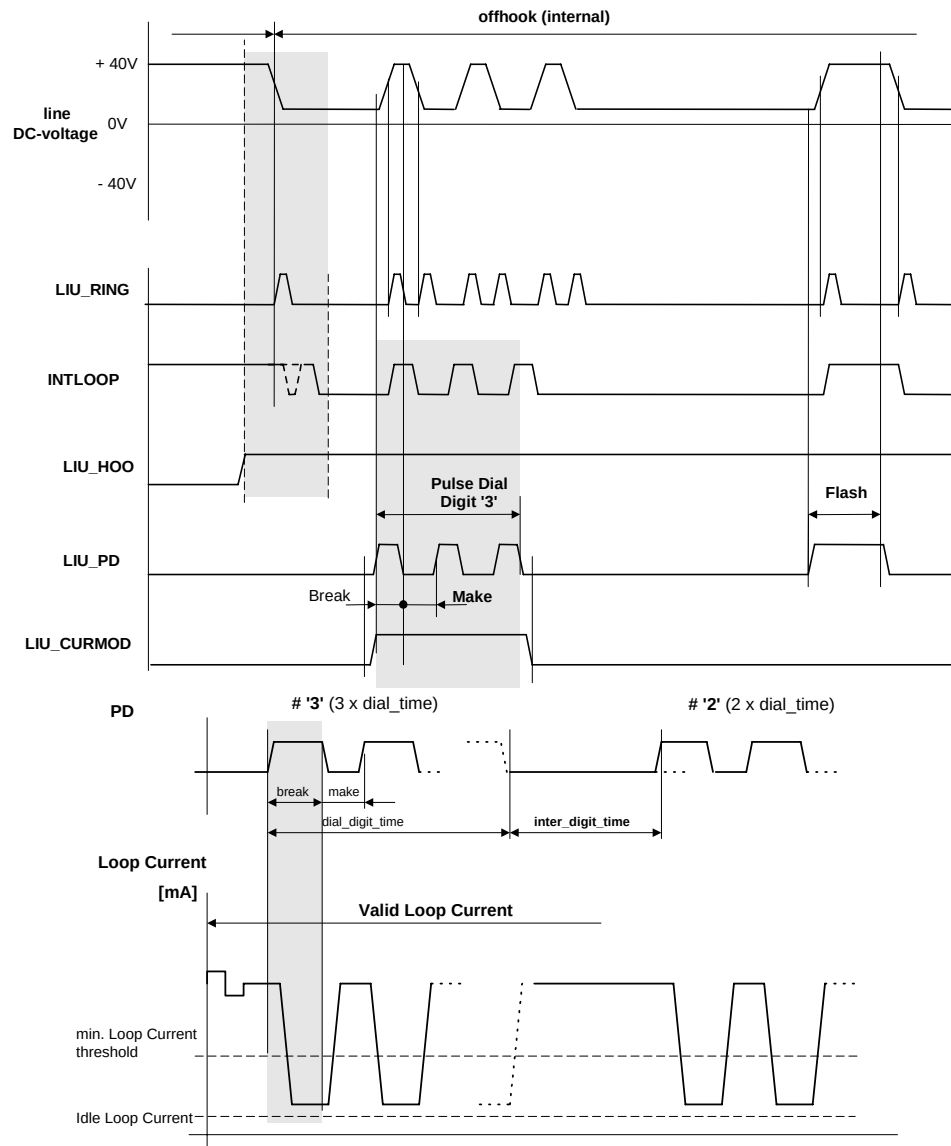
Pulse-Dial

To signal the network to establish a connection between the terminal equipment and another line equipment, a number of impulses is used to transfer a 'phone number' (a defined number of digits) of the other line equipment to the network. The digits which are used to specify a phone number are coded by the number of line disconnection's and reconnections of the PD signal. These voltage and current changes are mirrored at the line signals (LA, LB)



The digit of a phone number corresponds to the number of disconnection's (Break) and reconnections (Make). A digit '3' has three 'Breaks' and three 'Makes'.

The PD pulse duration relationship of break-time and make-time is country specific.



CLI Services

To signal a CLI service transmission start, during CLI service handling, the terminal equipment has to draw a current pulse from the network (Wetting Pulse) by activating PD.

(see *HOOK Signal Description*)

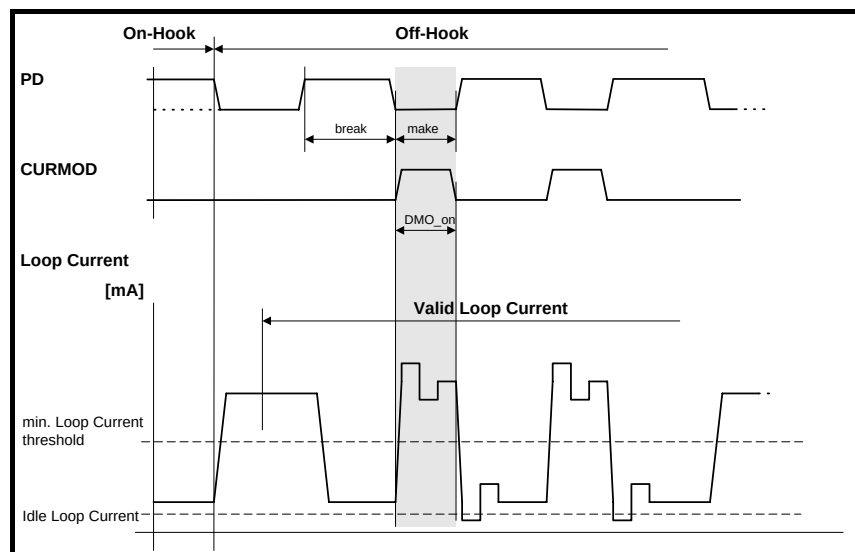
13.26.14 CURMOD

CURMOD Handling

To get the required waveform on the line (acc. PTT regulations) an additional current has to be supplied by the LIU during dialling. The CURMOD signal serve this special purpose during Pulse Dial. The timing relationship of CURMOD and the Pulse Dial port depends on the country specific regulations.

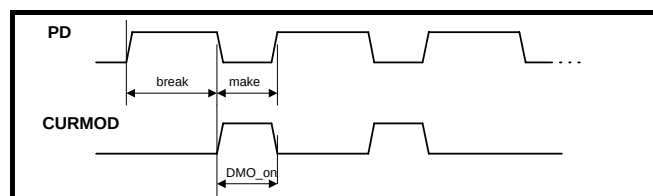
Pulse-Dial

To enhance the current (switching) characteristics (smaller rising times of the loop current) a current enhancement signal is activated during Pulse Dial. This CURMOD signal is activated synchronous with the PD signal during Pulse Dial. The timing relationship is country specific, but similar.



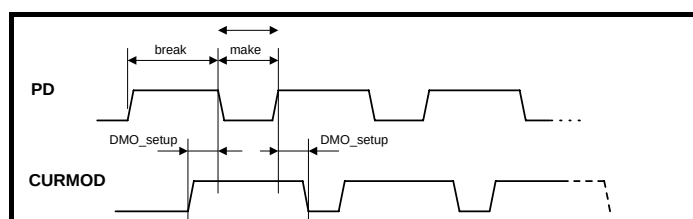
CURMOD Set-up (General)

In general the CURMOD is activated with the first make and handled like the Pulse dial port including the last break, where the CURMOD port is deactivated.



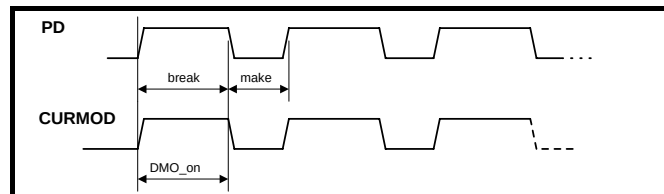
CURMOD Set-up Spain

The CURMOD port is activated before make within a set-up time and cleared after a set-up time and make.



CURMOD Set-up France

The CURMOD port is handled using the inverted Pulse Dial port information.



CURMOD Set-up Portugal (International)

The CURMOD port is activated before the first break and kept active until the last make of the digit is done. If several digits are dialled, the CURMOD stays active until the last make of the last digit is done.

13.26.15 CIDIMP

On-Hook, Off-Hook Line Configuration

No **CIDIMP** signal handling involved

CLI Polarity Reversal, CLI Services

To adapt the line impedance during CLI Services, the **CIDIMP** control signal has to be activated. If activated a impedance is connected in parallel to the nominal source impedance of the terminal equipment.

CLI Impedance Table

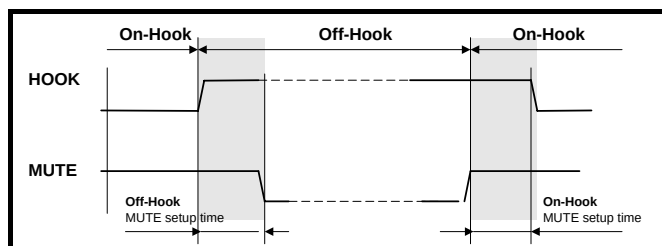
<i>LIU state</i>	<i>HOOK</i>	<i>PD</i>	<i>CIDIMP</i>	<i>LOOP</i>	<i>Description</i>
Onhook / No CLI handling	0	0	1	1	No CLI Impedance
Onhook / CLI Impedance	0	0	0	1	CLI Impedance
Onhook / CLI Wetting Pulse	1	0	1	0	Draw loop current

13.26.16 MUTE

On-Hook, Off-Hook Line Configuration

To receive tone signals during On-Hook, when no line connection has been established, and to prevent corruption of tone signals during Off-Hook, a muting signal has to be used. To enable receiving of tone signals during On-Hook,

MUTE has to be deactivated. If transmitting of modem signals during Off-Hook is necessary the muting control signal has to be activated.



To gain a smooth **On-Hook** to **Off-Hook** transition and vice versa without any audible spikes, the muting signal has to be switched accordingly using a set-up time (**Off-Hook MUTE set-up time**, **Off-Hook MUTE set-up time**).

Pulse-Dial

To prevent any influence of voice signals from being transmitted via the line, or dial pulses heard via the handset, a mute signal disables the voice path if activated. The **MUTE** signal has to be activated prior dialling of a number and has to be deactivated, to re-establish the voice path, after the digit has been dialled.

DTMF-Dial

To prevent any influence of voice signals from being transmitted via the line or dial tones heard via the handset and to establish a connection between the modem and the line (MTXD), the mute signal disables the voice path if activated. The MUTE signal has to be activated prior dialling of a number and has to be deactivated, to re-establish the voice path, after the digit has been dialled.

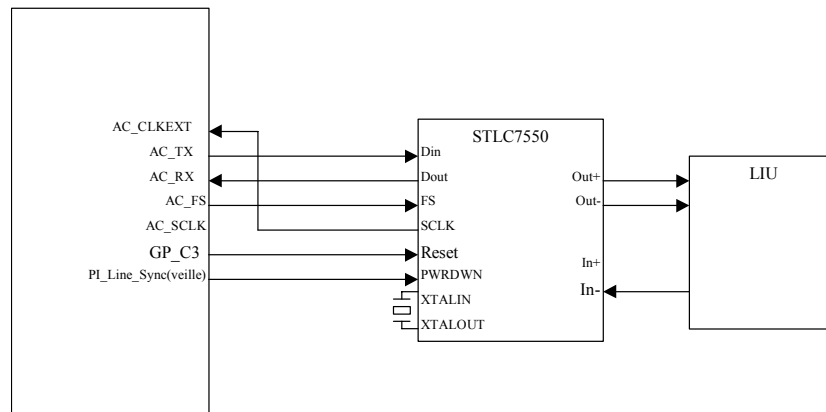
13.26.17 OFF_HOOK

Handset Lift, Handset Drop

To indicate the lifting of the handset to seize the line or to record voice during TAM handling a change of this signal has to be detected. No line access is established by activation of the cradle signal only. A corresponding LIU configuration has to be executed to establish a valid line connection.

13.27 Connection of the Codec to DC2 (low end)

For low-end version, the codec is directly connected to the Digicolor2. The modem function is realised in firmware. The codec is a STLC7550 codec from STM.



The codec is clocked by a 18,432MHz crystal.

To provide a proper clock to the serial link, the codec must be configured as a slave, providing the SCLK. For this pins MCM is tied to 1 and M/S to 0. The bus clock SCLK is connected to the AC_CLKEXT of the Digicolor2 and the output AC_SCLK of the Digicolor is left unconnected.

The register Config2 of the codec interface block should be programmed as follow:

- Bit 7-6: extclk_md[1:0]= 10
- Bit 5: tr_extclk = 0
- Bit 4: tr_nbaud = 1

With this configuration, the codec block uses the SCLK coming from the codec as its internal clock and the SCLK coming out of Digicolor2 is equal to the input AC_CLKEXT.

13.28 Connection of the codec to modem and DC2 (high end)

The chip modem is an Agere data pump (DP2Vxx) + CODEC (1034C). V32 to V90 data pump can be used. The data pump is supervised by digicolor2 on peripheral bus.

The line interface can manage an external telephone.

13.29 Audio

The microphone of the handset is polarised through R904, C901, R905 and R909. The signal then goes through a dual stage amplifier Z900 (section 2 and 3) and can be muted by Z901 section 2.

The signal coming from the line is amplified by Z900 and can be muted by Z901 section1.

The last section of Z900 is used for sidetone suppression.

LIU_MUTE

This signal is used to switch on and off the handset. When LIU_MUTE is set, the microphone is disconnected and the speaker is attenuated by xxdB.

MUTE	Source
0	Not Muted , Handset connected
1	Handset muted.

13.30 Speaker

The speaker can reproduce signal coming from two sources:

- Signal coming from the line for line monitoring.
- Signal coming from Digicolor2 (Tone) for the beeps and ringing tone.

The volume of the ringing signal and of the beeps is controlled using a digital multiplexer (Z550) to choose the gain of the audio amplifier and the source of the signal.

The output of the multiplexer is amplified by two LM358 (Z551 section 1 and 2) and the by a discrete amplifier (Q550 and Q551).

State	VOL3	VOL2	VOL1	VOL_EN*	OUTP
Ringer high	H	H	H	L	7
Ringer medium	H	H	L	L	6
Ringer low	H	L	H	L	5
Line monitoring high	H	L	L	L	4
Line monitoring medium	L	H	H	L	3
Line monitoring low	L	H	L	L	2
Mute	X	X	X	H	0

13.31 External connection

13.31.1 Line Connector P701

Name	Pin	Function
NC	1	Not connected
R2	2	Loopback L1
L2	3	Telephone line pair
L1	4	Telephone line pair
R1	5	Loopback L2
NC	6	Not connected

13.31.2 External Phone connector P700

Name	Pin	Function
NC	1	Not connected
NC	2	Not connected
R2	3	Loopback L1
R1	4	Loopback L2
NC	5	Not connected
NC	6	Not connected

13.31.3 Handset connector P901

Name	Pin	Function
MIC-	1	Microphone
GND	2	Ground
DECT_EA R	3	Loudspeaker
MIC+	4	Microphone

13.31.4 DECT connector(P900)

Signal	Pin	I/O	Digicolor2	Pin	I/O	Comment
Vcc	9	-	-	-	-	Power supply 5V
RxD	8	I	USART1_ TX	145	O	Serial data receive
TxD	7	O	USART1_ RX	143	I	Serial data transmit
-6V	6		-	-	-	NC
DECT_RES	5				-	Reset for the dect base
AGND	4		-	-	-	Analog ground
Audio_in	3		-	-	-	Audio in
Audio-out	2		-	-	-	Audio out
Agnd	1		-	-	-	Analog ground

13.32 USB Device

USB Device function is implemented into Digicolor2.

The USB section allows USB 1.1 full speed communication with a host controller.

An external transistor circuit drive the pull-up resistor (1.5K Ω) on the D+ signal for high speed USB device. The transistor protects Digicolor I/O from abnormal connection.

Signal connections to digicolor2

USB Slave	I/O	Level	Digicolor2	Signal
USB_B_P	I	1	PP_DRIVE	USB Bus Power
USB_O	O	1	PP_D1	High speed mode
D+	I/O	-	USB_DP	data
D-	I/O	-	USB_DM	data

Note: Input or Output direction from the Digicolor2 side.

13.33 Operation panel unit interface

Description

OPU interface is a 8 pins connector

Functions on the OPU :

- Keyboard 64 keys max.
- 2 LED
- LCD 2 lines x 16 characters + icons.
-

Interface

OPU is controlled with digicolor2 serial link USART0 and I/O.

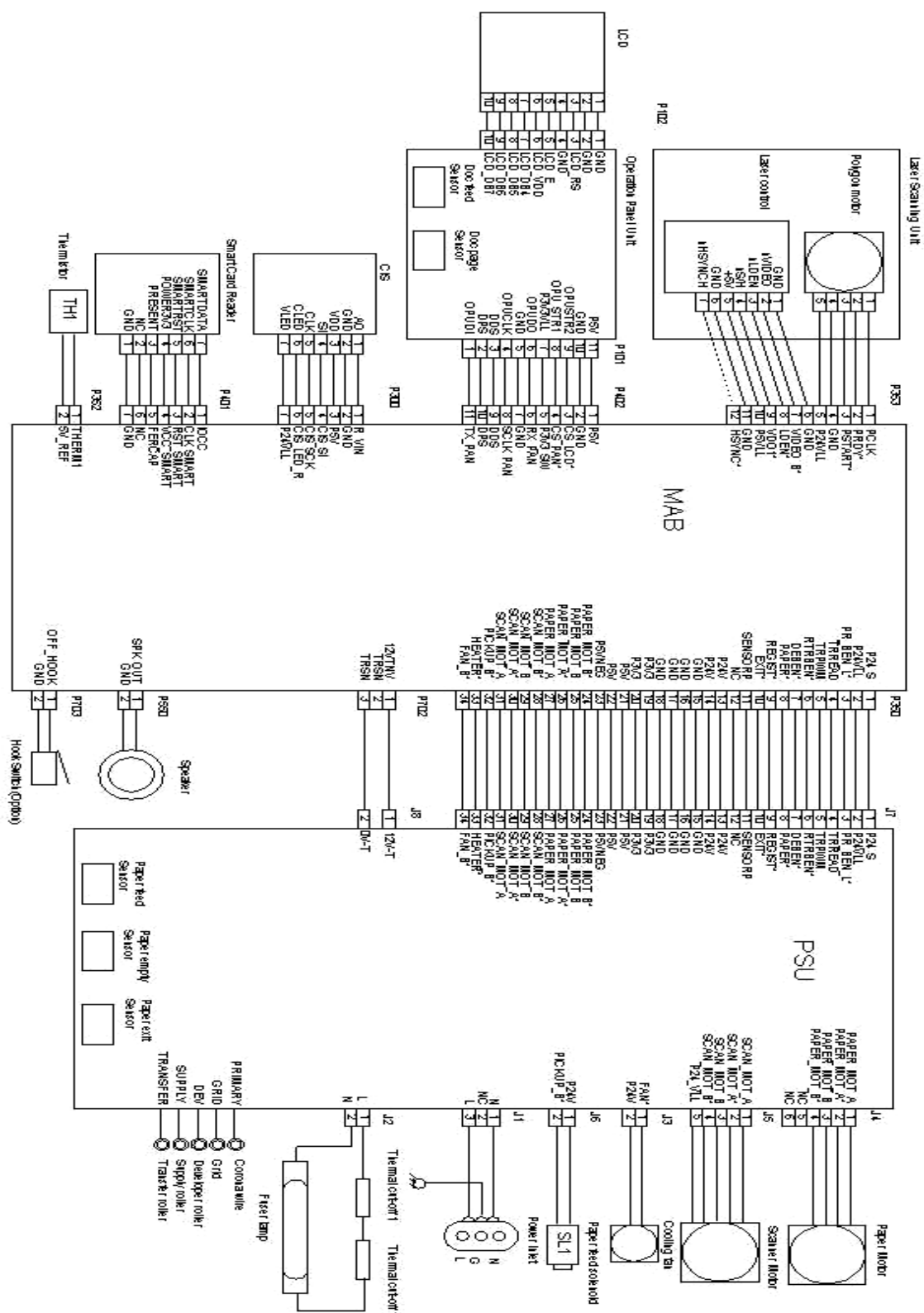
13.33.1 Connector P402

OPU	I/O	Level	P400	Digicolor2 I/O	DC2	function
P5V			1			Power supply 3.3V
GND			2			Ground
CS_LCD*	O	1	3	PP_nACK	156	LCD chip select
CS_PAN*	O	1	4	PP_nSTROBE	167	Keypad chip select
TX_PAN	O		5	USART0_TX	1	Serial link TX
RX_PAN	I		6	USART0_RX	2	Serial link RX
GND			7			Ground
SCLK_PAN	O		8	USART0_CK	8	Serial link clock
DDS	I		9	GP_A2	28	Document sensor (ADF)
DPS	I		10	PI_TGEN0	131	Document position sensor(ADF)
P3.3VOPU			11			

LCD access is write only. Other signal for LCD control are sent through serial link TX (4 parallel data bit & RS (Register Select)).

The sensors are only supplied if PSAVE_OPU is low.

13.34 Wiring Diagram



14 Technical Data

14.1 General

Dimension	370 x 200 x 330mm (W x H x D)
Weight	Approx. 7,25kg
Mains Connection	220 - 240 Volt / 50-60Hz
Power Consumption	Standby < 8W Transfer < 17W Reception < 20W Standard
Recommended Ambient	Temperature 17 – 28°C Relative Humidity 20 –80% Non condensing
Emission	EN 55022 Class B EN 61000-3-2 EN 61000-3-3
Immunity	EN 55024

14.2 Paper

Automatic Document Feeder	20 Documents
Paper Sizes	A4 210 x 297mm Letter 8,5 x 11 Inch 216 x 279mm Legal 8,5 x 14 Inch 216 x 356mm
Paper Thickness	0,08 – 0,12mm
Paper Weight	60 – 90g/m2 Legal: 90g/m2
Paper Tray	Max. 250Sheets

14.3 Toner Cartridge

Capacity (5% Black – Slerexe Letter)	
Starter Cartridge	Approx. 1000 Pages
Additional Cartridges	Approx. 3000 Pages

14.4 Printer

Type	Class I Laser Printer
Warm - Up Time	Approx. 15sec.
Resolution	600 x 600dpi
Printing Speed	10 Pages/Minute
Print With	200mm

14.5 Telephone

Connection Type	Public Switched (PSTN) Private Branch Exchange (PABX)
Telephone Book Entries	Approx. 200

14.6 Fax

Device Type	Group 3
Compatibility	ITU-TT.30
Encoding	MH, MR, MMR
Fax Memory	120 Pages
Transfer Speed	33,6K
Horizontal Resolution	8dots/mm
Vertical Resolution	Standard 3,85 lines/mm Fine 7,7 lines/mm

14.7 Copier

Type	Black and White, 64 grey tones
Resolution	Fast 200 x 300dpi Quality 400 x 300dpi Photo 400 x 300dpi
Copying Speed	10 Pages/Minute
Multiple Copies	Up to 99 Pages

14.8 PC Connection

Connection Type	USB 1.1 (USB 2.0 Full Speed)
Supported Operating Systems	Windows® 98SE / 2000 / ME / XP
Scanner Driver	TWAIN

14.9 Scanner

Type	Black and White, 256 grey tones
Resolution	300 x 300dpi
Scan Area	Max. 218 x 600mm
Scan With	208mm
Speed	6sec. / A4-Page

14.10 SMS (Short Message Service) *

Gateway	V23
Memory	30 Messages
Message Length	160/640 Character

* Depending on country and telephone network

15 SAFETY - Test Specification

15.1 Demand

Universal device suitable for use as **IT / HV / ECT - TEST**
for Terminal & IT – Equipment according to EN / IEC 60950-1:2001

15.2 Abbreviations

IT Isolation Test
HV High Voltage Test
ECT Earth Continuity Test
UUT Units Under Test
USB PC Interface
TNV PSTN Line / External
MAINS .. Primary Circuit
SELV Secondary Circuit
BODY ... Chassis (earthed)

15.3 Technical data

Test Voltage Range: 0 – 4500 V DC (adjustable)

Conformity of application: DIN VDE 0104

Measurement Current: $I_{\max} = 0,25 \text{ mA}$ ($\Rightarrow$ only for HV tests)
 $I_{\text{ECT}} = 25 \text{ A}$ ($\Rightarrow$ only for ECT test); Duration: min. 1 sec.

Test Voltages: a) $U_{T1} = \text{max. } 12 \text{ V DC}$;
b) $U_{T2} = 380 \text{ V DC}$; Duration: min. 1 sec.
c) $U_{T3} = 1680 \text{ V DC}$; Duration: min. 1 sec.
d) $U_{T4} = 4240 \text{ V DC}$; Duration: min. 1 sec.
(3000 V AC)

Rise / Fall Rate: $< 1000 \text{ V/ms}$ ($\Rightarrow$ automatic discharge after measuring cycle)

15.4 Additional requirements:

Statistical Evaluation: • count of units under test
(via PC) • count of faulty units under test
• test results recorded
• serial numbers recorded

15.5 Terminals / plugs

UUT >>> TNV = PSTN-line – ext.
SELV = USB = Body = chassis
MAINS = mains terminal – plugs

IT / HV > see operator's manual of test equipment (available in engineering department)
The principle of measurement is a 4-wire test method.

15.6 Description / Earth Continuity Test / Isolation Test / High Voltage Test

15.6.1 General

No start-conditions are defined; possibility of automatic or manual operation
The IT / HV test - voltage is an adjustable direct voltage (preferred instead AC)
The maximum HV test-current is 0,25 mA and therefore is regarded as safe for humans (no cover necessary)
The duration of the test is 1 second min.
After each test performed, the UUT must be discharged automatically by the IT
High voltage-Test: PSTN-line (TNV-3) / housing, handset ... not applicable
Remark: performed at the Type Examination test

15.6.2 Test Procedure

1) Earth-Continuity – Test -> Earth (mains plug) / chassis (bottom):

To ensure the required earth continuity resistance $< 0,1$ ohms this test is performed in compliance to the standard IEC/EN 60950-1:2001, clause 2.6.3.3
 U_{T1} max = 12 V DC ; I test = 25 A ; t min > 1 sec

2) Isolation - Test -> PSTN-line (=TNV-3) / chassis / USB-ground :

To check the electric strength of the insulation between the TNV-3 and the chassis all devices (100%) are tested at two voltages (I max = 0,25 mA ; t min > 1 sec):

- a) $U_{T2} = 380$ V DC → to check, if the protection device is assembled correctly
(e.g. no short-circuit due to loose screws)

Remark: 380 V because of IEC / EN 60950-1:2001, clause 6.1.2.1: requested minimum DC spark over voltage has to be 1,6 times the upper voltage of the rated voltage range

- b) $U_{T3} = 1680$ V DC → to check, if the protection device works correctly (quality issue)
Remark: 1680 V according the datasheet of the used surge arrester: nominal DC spark over voltage is $1400\text{ V} \pm 20\%$

3) High voltage – Test -> 100 % -Test primary / secondary with a voltage of 4'240 V DC is performed between MAINS (terminal plugs) and chassis / USB-ground in conformity to IEC/EN 60950-1:2001, clause 5.2.2 (table 3b): $U_{T4} = 4'240$ V DC;
I max = 0,25 mA; t min > 1 s

4) High voltage – Test -> 100 % - Test PSTN (TNV-3) / mains with a voltage of 4'240 V DC is performed between TNV-3 and mains in conformity to IEC/EN 60950-1:2001, clause 5.2.2 (table 3b): $U_{T4} = 4'240$ V DC ;
I max = 0,25 mA ; t min > 1 s

16 TROUBLE SHOOTING

16.1 Overview

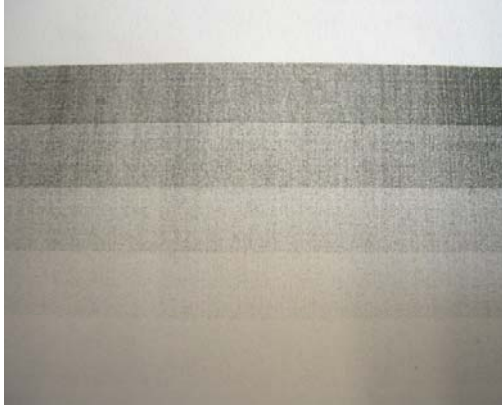
FAILURE DESCRIPTION	TO CHECK	ACTION
Bad printout	Grease on Transfer roller?	Clean the roller
	Pick-up contacts blades to cartridge (5 contacts, 4 to PGU & 1 Ground)?	Correct the blades position or replace Pick-up module
	Pick-up contacts to PGU (4 to Cartridge and 1 to Transfer roller)?	Correct the position or replace Pick-up module
	Cartridge OK?	Try with new Cartridge
No printout/No paper feed	Plate Regist guide correct in position?	Correct the position
	Pick-up unit correct in position?	Remove Pick-up and correct the position
	Connection between Pick-up and PGU?	Check contacts or replace Pick-up
	Cables from Gear box block the paper or fuser movements?	Check if cables in Position and all OK
	Separation pad in position	Correct the position
	Solenoid works correct	Correct Solenoid position or connect the solenoid to PGU or replace it
Error message “Check printer device 02”	Connection between Fusing unit to Mainboard OK?	Check connector or replace the Fusing unit
	Thermistor connection OK?	Replace Thermistor, or the Fusing unit when still not solved, replace the Mainboard
Error message “Check printer device 04”	LSU Cable correct both sides connected?	Connect the cable correct
	Pins of LSU damaged?	Replace LSU
Paper Jam	Plate Regist Guide in position?	Correct position
	Paper Exit sensor missing or damaged?	Replace Paper Exit sensor
	Fusing unit correct in position?	Dismount and correct position
	Exit backup roller missing?	Replace the roller

Black copy	Scanner or printer part	Print Function list when OK, check scanner part
	CIS Cable OK	Correct cable position or replace Cable
	CIS damaged	Replace CIS
Black printout	Cartridge OK	Use new Cartridge
	Primary and Grid contacts to PGU	Check Pick-up position to ensure correct contacts to PGU, and clean the contacts
White printout	Cartridge OK?	Use new Cartridge
	Transfer roller and contact to PGU?	Ensure correct contact and clean contact to PGU and Roller
Light printout	Cartridge OK?	Use new Cartridge
	Mirrors in Position or damaged?	Correct the Mirrors position or replace the mirrors
No Document feeding	Document Sensor OK?	Replace Sensor
	Fax motor (Scanner motor) OK?	Change motor
	Gears from Motor to Doc feeding OK?	Check gears on Gear box
Document Jam	Scanner Sheet OK?	Replace scanner sheet foil
	Document feeding roller?	Check and clean if dusty or dirty
No Display	Power OK	Check Power Cable if plugged, if damaged, change Power cable or PGU
	OPU Cable and OPU	Change Cable or OPU
	Display Cable and Display	Replace Display

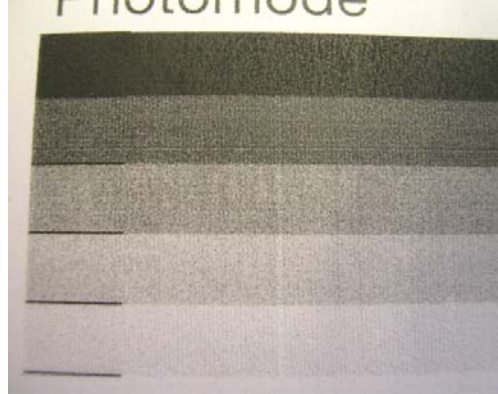
16.2 Examples

16.2.1 Check with other cartridge

Cartridge empty



White lines from cartridge (normally very thin)

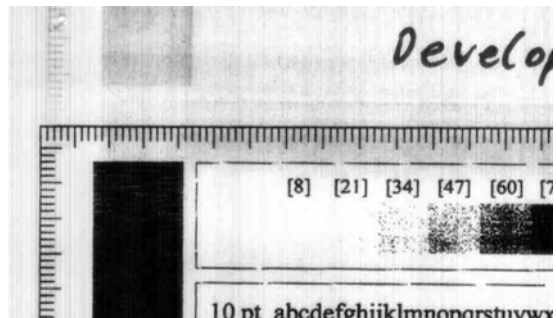


16.2.2 Check contacts

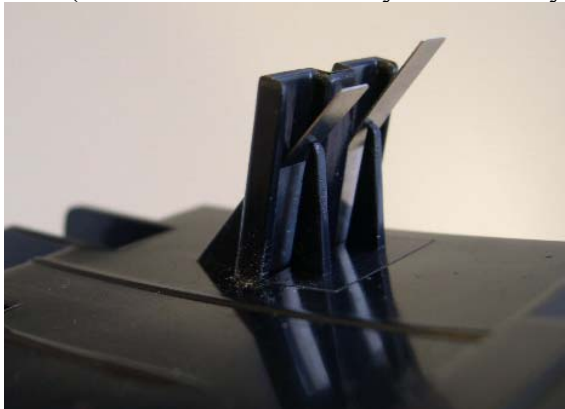
Pick UP-unit contacts between cartridge and PGU (2 contact blades sideways)



Failure: grey shadows, ghosts



Pick UP-unit contacts between cartridge and PGU (2 contact blades sideways frontal way)



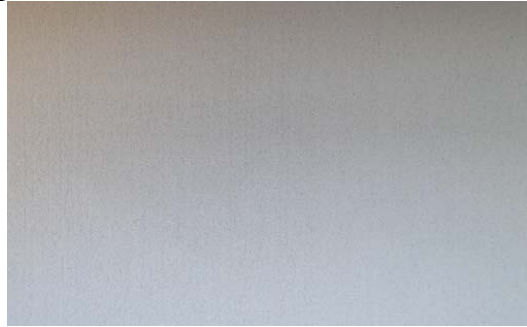
Failure: black page



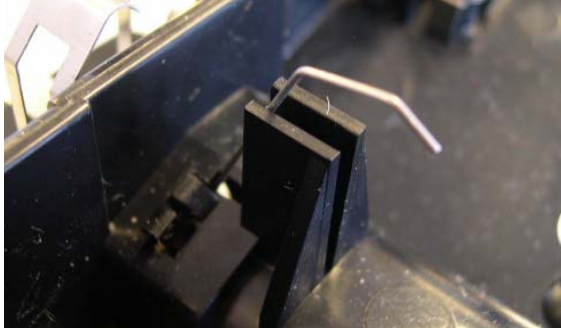
Contact electronic-plate to cartridge (ground)



Failure: copy too bright, white printout possible



Contact Pick UP-unit between Transfer roller and PGU



Failure: printout too bright

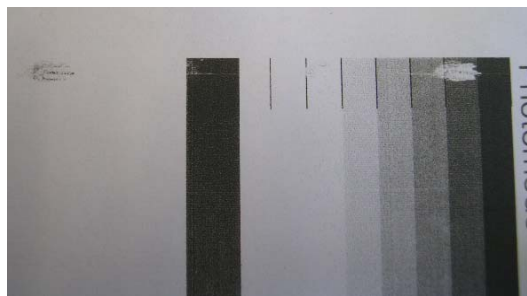


16.2.3 Grease on transfer roller

Picture of dirty roller



Typical printout



16.2.4 Copy quality

Check if failure is from scanner or printer (black copy)

Connection to CIS ok

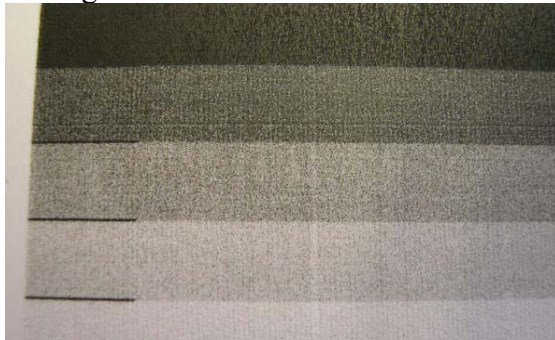


Connection to mainboard ok

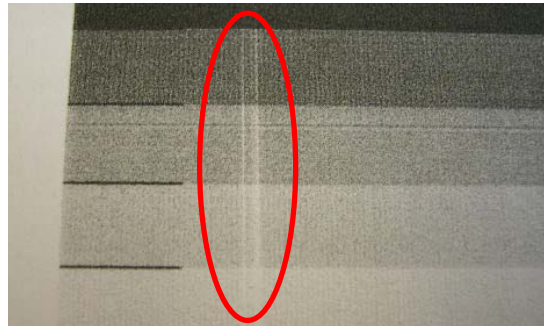


Vertical lines different sizes and shapes (mostly on photo mode)

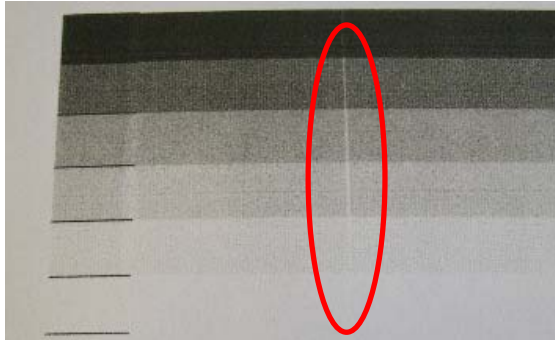
Example bad cartridge -> replace the cartridge with new one



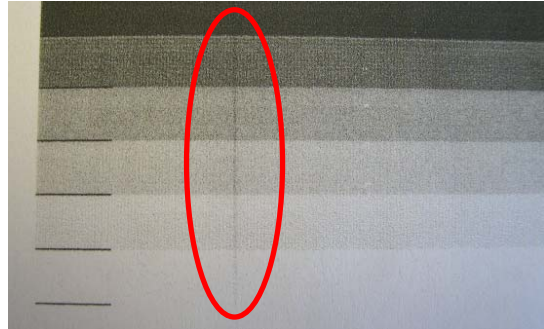
Copy with bad white reference -> make a new white reference



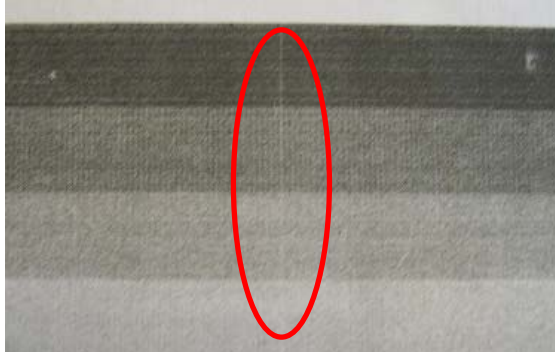
Dirt on mirrors -> clean the mirrors



Dirt on CIS -> clean the CIS



Damaged CIS -> replace CIS



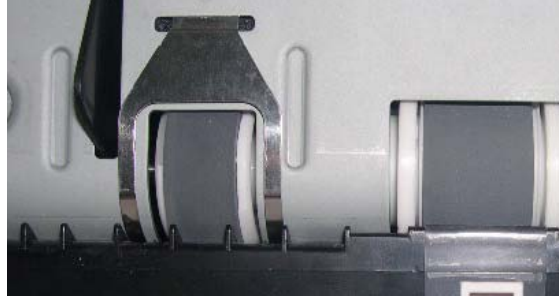
16.2.5 No printout / problems with paper feed

Plate regist guide not correct in position -> skew paper feeding

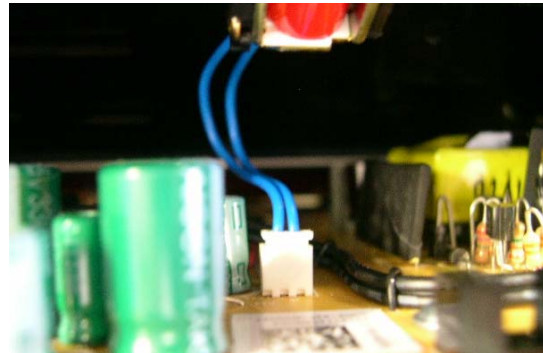
Wrong position or broken



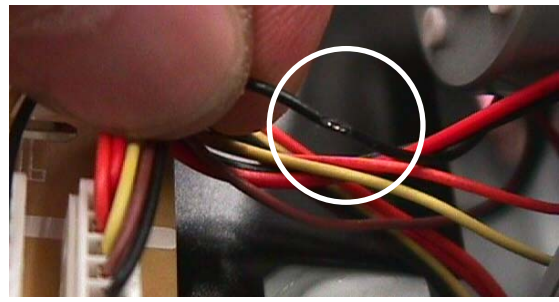
Correct position



PUP-unit Solenoid not connected to PGU or defective-> no paper feeding (cannot hear click of solenoid)

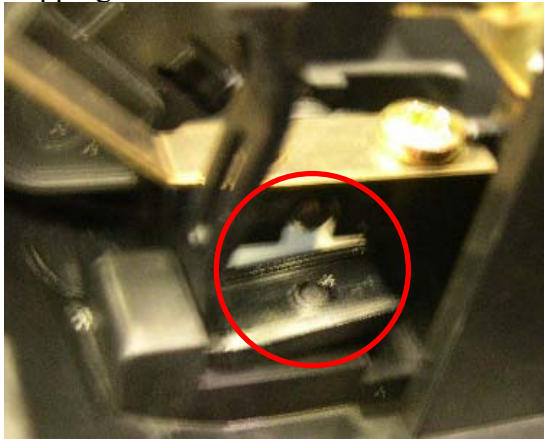


Cables tweaks under fusing unit -> No paper feeding (couldn't hear the motor drive)

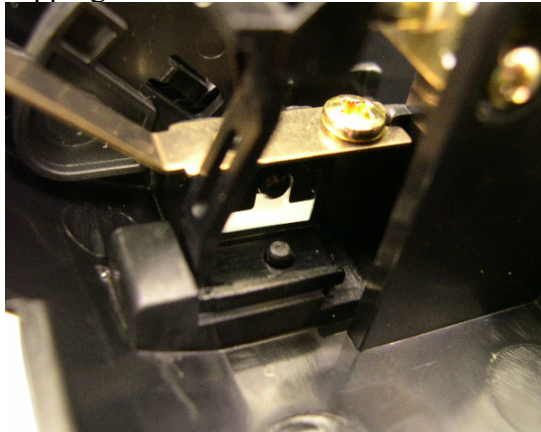


Lever of PUP-unit not correct mounted -> No paper feeding sometimes but you can hear click of solenoid

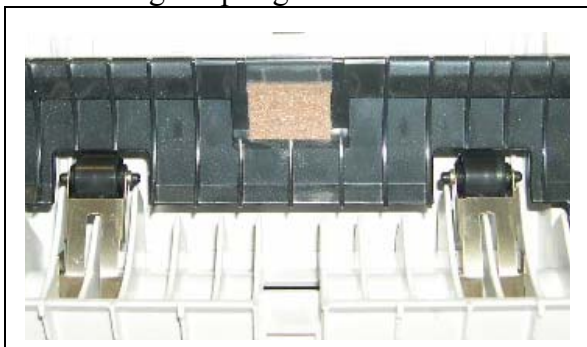
Snapping of lever not correct



Snapping of lever correct

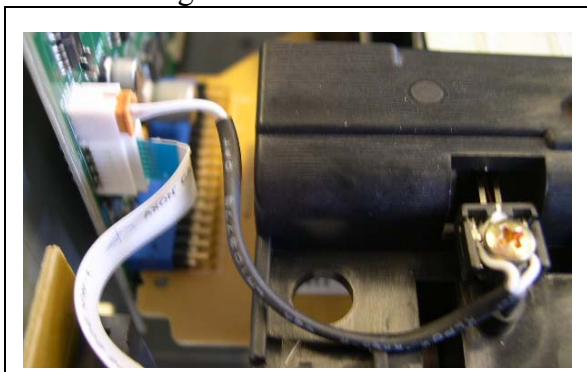


Check if Regist Spring correct mounted



16.2.6 "Check printer device 02"

Check if fusing unit connected to mainboard or cable damaged

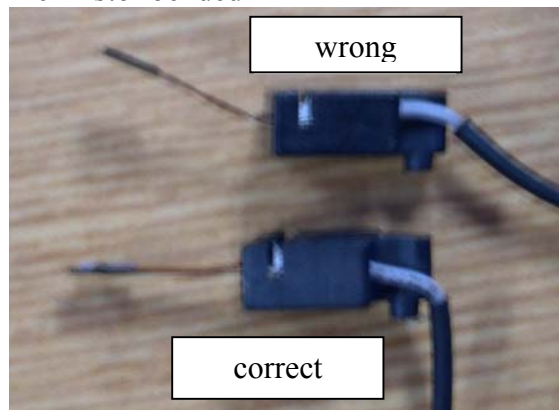


Thermistor on fusing unit damaged

Cable bad connection



Thermistor bended

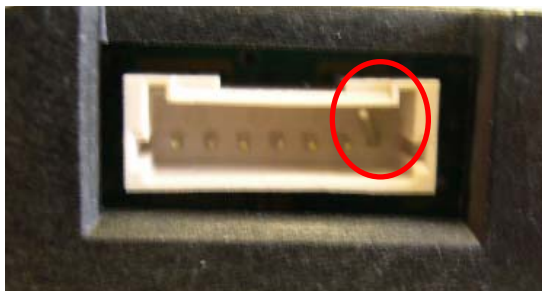


16.2.7 “Check printer device 04”

Check LSU cable connection



Check Pins of LSU if damaged

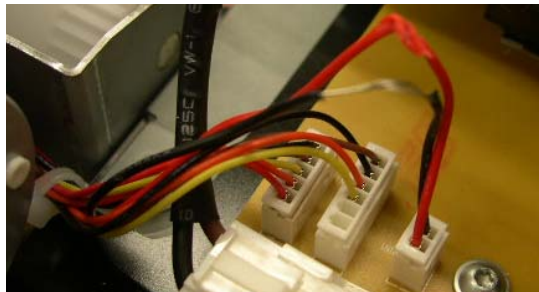


16.2.8 Paper jam 2

Check by pressing Plate regist guide a force, works correct.



Check if Fan or Motor Cables pressed or screwed under Fuser

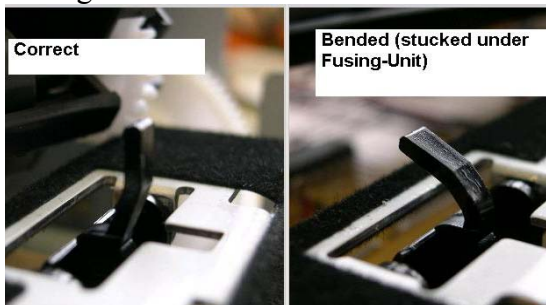


Check if Paper-In-Sensor sticks or damaged

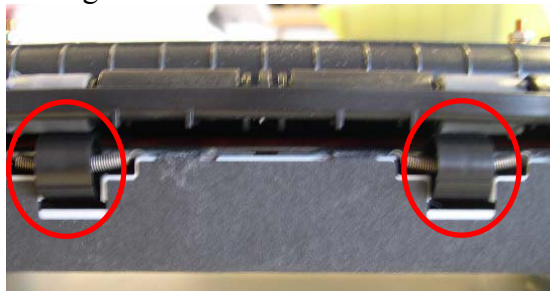


16.2.9 Paper jam 3

Check Paper-Exit-Sensor damaged or missing



Check Exit backup rollers in position or missing



16.2.10 Document feed problem

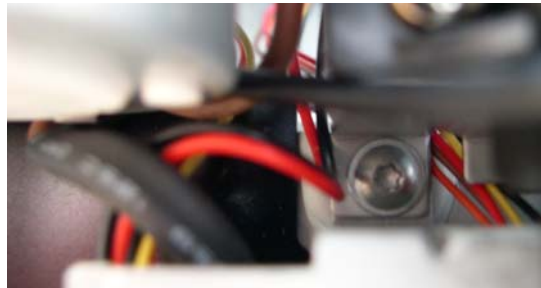
If Document-Sensor sticks or missing



LSU cover Foil out of right position

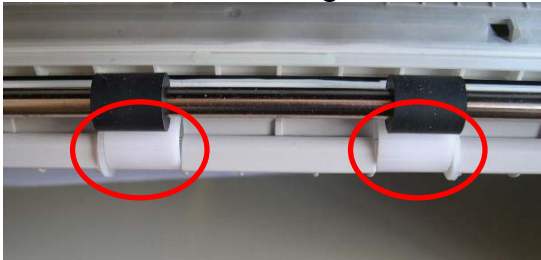


Check scanner cables connection.

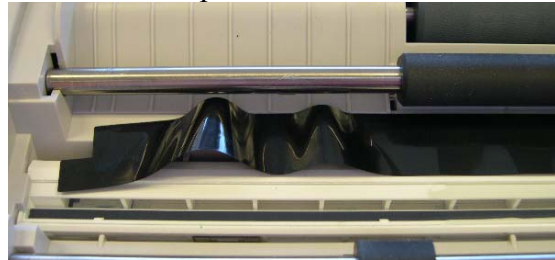


16.2.11 Document jam

Exit-Pinch-Rollers missing



CIS Foil out of position



16.2.12 Multifeed of document

Position of foil on LSU-cover wrong



Position of foil on LSU cover correct



16.2.13 ScanRef-Failures

Document sensor 2 blocked

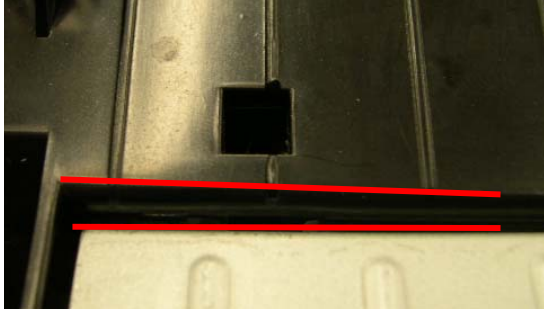


Document Sensor 2 Correct

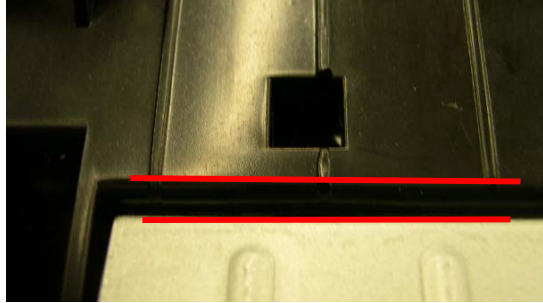


16.2.14 Skew Printer

Check gap between Pick Up and Fuser module Snapping PUP. unit not correct

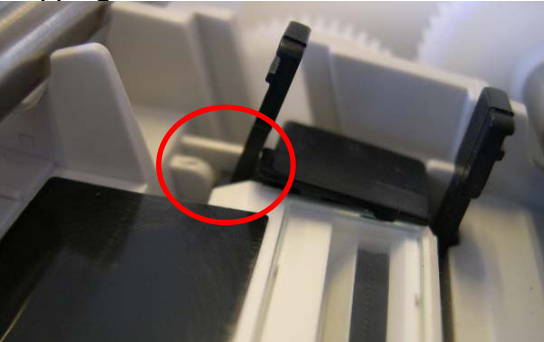


Snapping PUP-unit correct

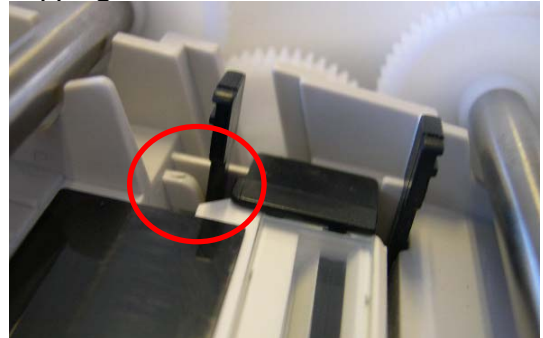


16.2.15 Skewed Scanner

Snapping of CIS-Holder not correct



Snapping of CIS-Holder correct



16.2.16 Sensor-Test failed

Paper-stock-sensor damaged or missing



Lever Rear-cover bended or broken

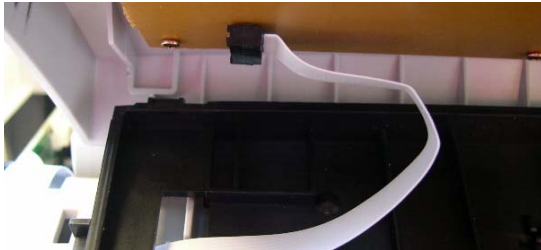


Paper-in-sensor blocked



16.2.17 No display

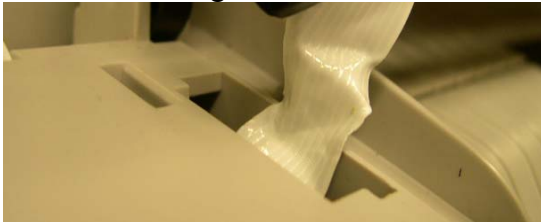
OPU-cable connected on OPU



OPU-cable connected on MAB



OPU-cable damaged



LCD-cable connected



OPU connector damaged at sockets

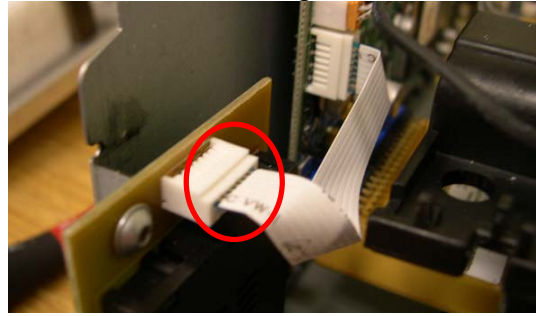


16.2.18 Smartcard-Reader

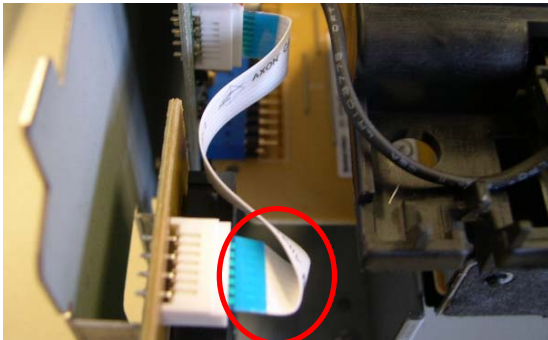
Smartcard-Reader not connected



Smartcard-Reader wrong connected

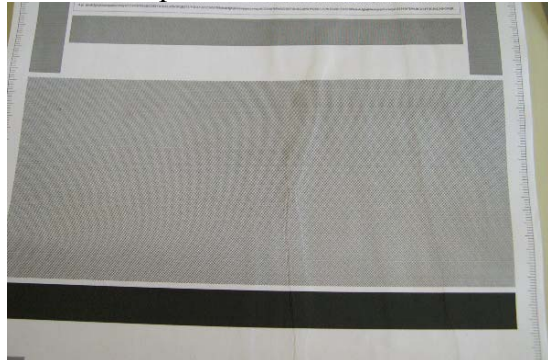


Smartcard-Reader correct connected

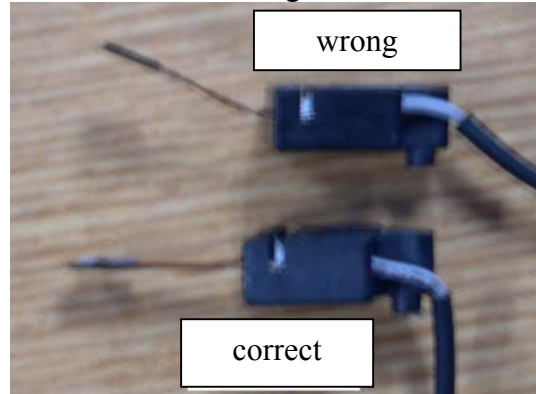


16.2.19 Wrinkles on printout

Wrinkles on printout



Thermistor not touching roller



17 TEST PROCEDURE (Minimal requirement after repair)

Follow the steps as described below:

